

Founded as Metal Industry, January, 1903
by Palmer H. Langdon, 1868-1935

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Published Monthly by
FINISHING PUBLICATIONS, INC.

Serving the electroplating and industrial coating fields with specialized monthlies and guidebooks since 1903. Companion publication, ORGANIC FINISHING.

381 Broadway
Westwood, N. J.
WEstwood 5-1530

Branch Offices

Los Angeles 14, California
742 South Hill Street
MAdison 6-5421

Hornell, N. Y.
19 Elmwood Place
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Society of Business Magazine Editors

Devoted Exclusively to Metallic Surface Treatments

METAL FINISHING

SEPTEMBER, 1954

VOLUME 52 • NUMBER 9

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COMING SOON

The method of determining efficient rinsing conditions is covered in an article on counterflow rinse tank design.

The role played by cyanide neutralization in cleaning steel surfaces to improve corrosion resistance.

Tin plate production at one of the country's west coast plants is described.

Improvements in deburring practice due to wet barrel finishing of precision parts are given in this article on wet tumbling.

SUBSCRIPTION INFORMATION

United States and Canada \$4.00 per year, other countries \$8.00. Single copies 45c in United States and Canada, other countries 85c. GUIDEBOOK-DIRECTORY 22nd edition 1954 current, 570 pages 5 1/4 x 7 7/8 \$3.00. A copy of this book is included with subscriptions. Please remit by check or money order; cash should be registered. Request for change of address should reach us on or before the 15th of the month preceding the issue with which it is to go in effect. In sending us your change of address, please be sure to send your old address as well as the new one. It is difficult and often impossible to supply back numbers. Copyright 1954 by Finishing Publications, Inc. All rights reserved. Contributed articles, letters on pertinent subjects are invited. Their publication, however, does not necessarily imply editorial endorsement. Re-entered as second class matter June 13, 1940 at the post office at New York, N. Y. under the Act of March 3, 1879.

20 FOOT STAINLESS STEEL TANKS POLISHED WITH LEA COMPOUND



Brewing is one of those processes that requires the utmost in sanitary protection — hence the *stainless steel* for this starting tank being fabricated by the Nooter Corporation of St. Louis for the Anheuser-Busch brewery in Los Angeles, the first all stainless steel equipped brewhall in this country.

Brewers too, insist upon *smooth contact surfaces* which promote maximum efficiency in cleaning and sterilization. No rough spots to harbor food bacteria. And the "spic and span" appearance of smooth gleaming surfaces is of no small importance. Hence the polishing!

In the picture above you see a polisher putting the finishing surface on the interior of one of a group of six 20 foot stainless steel tanks and he's polishing it with one of the many grades of Lea Compound.

The point we want to make is not merely that in the Nooter plant they are using Lea Compound for polishing their

stainless steel tanks. It's the technical skill and advisory service available at Lea to help any company determine the best polishing and finishing method for each item to be finished. That comes first. All Lea Compositions are of the highest quality but only one composition or series of compositions is likely to be best for any given finishing step. Lea Technicians will be glad to tell you which method and which composition.

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Secrecy vs. Disclosure

At the recent International Conference on Electrodeposition and Metal Finishing, held in London, considerable discussion was engendered on the subject of secret formulas and proprietary processes. Pointed out was the regrettable tendency in recent years to present at scientific gatherings "technical papers" which, superficially, appear to be research reports but which, actually, are a subtle form of advertising, detracting from their value.

Such papers go into considerable detail about operating characteristics, properties of the coatings and advantages of the process but do not disclose sufficient information to permit impartial comparison or further development by research organizations. With some justification, it has been argued that this policy acts as a brake on metal finishing progress since no one but the supplier is in a position to proceed in the direction of further improvement.

The very reasonable argument of the vendor that he has a not inconsiderable investment in the development of his secret process is too important, however, to be ignored. There is no question but that he is entitled to realize a reasonable return and recovery of his financial stake. This necessitates maintenance of complete control of the formula by marketing it as a proprietary process.

The real question, it appears to us, is whether in the long run the vendor would suffer if complete details were disclosed at scientific meetings. Frankly, we do not know the answer. However, to take the case of most bright plating processes, although complete information is available in the patent literature, most users are satisfied to purchase the proprietary products. After all, wouldn't it be a little bit ridiculous for an individual cadmium plater to prepare sufficient amine reaction product of an aliphatic or carbocyclic ketaldone as a brightener to avoid purchasing the proprietary preparation? And, even if the particular chemical were available at a lower price from a chemical manufacturer, how many platers would be willing to forego the technical service and know how, the accumulated experience of the supplier, which is always available to purchasers of the process?

Infringement by other suppliers could really be considered the only objection to complete disclosure and possible legal action is usually a very powerful deterrent in such cases. Therefore, the problem boils down to whether secrecy as an industrial policy is more advantageous than the free exchange on which scientific progress has thrived. The answer lies with the supplier.

Nathaniel Hall

Statistical Quality Control for the Plater*

By Joseph B. Kushner, Director, Joseph B. Kushner Electroplating School, Stroudsburg, Pa.

IN the past two years, a great deal of interest has been aroused in plating circles, in what is known as *Statistical Quality Control*. S.Q.C., if you'll pardon our abbreviating this ponderous phrase, while relatively new to the plater, is not so new to industry. It was evolved about twenty-five years ago by a brilliant mathematician by the name of Shewhart, who discovered that by applying the laws of chance to a productive process, it was possible to save a lot of money and headaches for the producer. Since that time the ideas promulgated by Shewhart have gathered more and more momentum, and acceptance, among manufacturers everywhere. S.Q.C. has become in industry not just a byword but a password!

In the plating field, acceptance of these ideas has been much slower. About thirteen years ago, in March, 1941, to be exact, we wrote a piece dealing with the application of statistics and probability to barrel plating.⁵ It was, we believe, the first paper in plating literature, on such a subject. The next paper describing the use of statistics in controlling a plating process appeared eight years later,¹ then came a paper in 1952² and, in the past year we have had a flurry of papers on the subject.³ Obviously we are beginning to gather a little steam in this direction and it looks like we are going to gain more speed as time goes on. The applications of S.Q.C. to plating processes are growing, so it may be wise to find out what all the statistical shootin' is about.

Statistical Quality Control is, simply, the application of the laws of probability to the control of a productive process. Its purpose is to obtain a consistently uniform product (whatever it may be) with a minimum amount of wasted effort, time and material. So much for a definition.

S.Q.C. is not a plating panacea. It won't cure blistering, it won't of itself turn out a better deposit of metal. The only thing it can do for you as a plater is to help you turn out a more uniform job *consistently*. It is applicable in a practical way only when there is a large production of a given item (reasonably large, anyhow) or when many measurements are taken in a given process. With these thoughts in mind we can discuss some of the principles of S.Q.C.

*Based on material from the author's "Electroplating Know How Supplement."

A Simple S. Q. C. Experiment

Here is a very simple experiment that can be found in almost any textbook on probability. It will quickly demonstrate on what S.Q.C. is based. Take an ordinary sheet of ruled paper as shown in Figure 1, and draw a sharp pencil line down the center of one compartment (distance between two rulings). Call this compartment 0, marking it off so at the bottom. Mark off the compartments on either side of this center compartment as +1, +2, +3, +4 to the right and -1, -2, -3, -4 to the left.

Place the sheet of paper on a smooth table top. Now hold a sharp pointed pencil about two feet above the paper with the point down, lightly between the fingers of both hands, at a spot near the eraser. Take good aim at the center line of compartment 0, and let the pencil drop. The accuracy of your aim will be recorded automatically on the paper by the pencil point. Do this at least 100 times, taking careful aim each time.

Now count the dots in each compartment and record the results on a piece of cross section paper, with the number of dots in a given compartment as the ordinate (height) and the compartment number as the distance along the X axis from the center line (see figure 2). This gives us a Bar Chart of the process as shown in the figure. This is sometimes called a "histogram."

By studying the figure, it can be realized at once

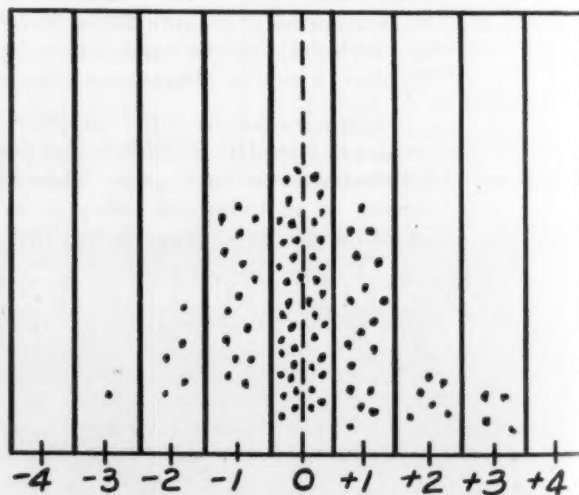


Fig. 1. Trial sheet for pencil dropping experiment.

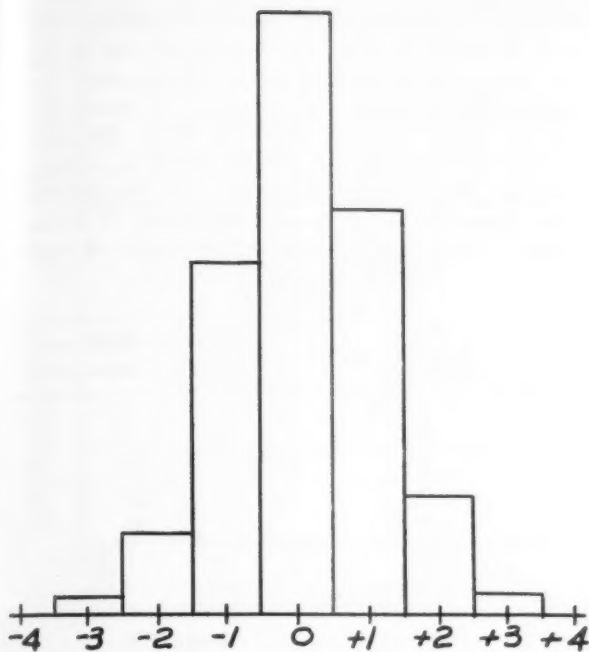


Fig. 2. Results of Fig. 1 plotted as histogram.

that if this experiment is performed many more times, say a thousand, and compartments are used that are much narrower than before, on plotting the result, one would ultimately end up with a smooth curve which would look like that in Figure 3. This curve has many names, some of which are: Gaussian or Normal Error Curve, Normal Probability Distribution Curve, Normal Distribution Curve, etc. The first name comes from the great mathematician Gauss, who described its properties.

All kinds of chance and accidental errors follow the same law which the pencil shots followed in this experiment.

The curve of Figure 3 embodies the following statement of this law: 1. If a process is subject only to errors due to chance then a positive error is just as likely to occur as a negative error. 2. The probability of a larger error occurring is less than that of a small error occurring. 3. Very large chance errors do not occur.

The third axiom (it is an axiom because, while it is obvious, we cannot prove it in any way but by experience) *is the crux of quality control.* We will illustrate it by means of our pencil experiment.

Let us say you have practiced pencil dropping many times and have obtained reasonable skill in aiming the pencil. After a large scale experiment your results would look something like Figure 3. This is your normal distribution curve for the process.

Now let us suppose that unknown to you (you're wearing a heavy overcoat!) someone operates a powerful fan which blows a breeze across the room while you go about another target shooting experiment. You plot the results again and to your surprise you find that the curve looks like Figure 4. Even though you have been dropping the pencil in exactly the same way, most of the results are in compartments to the right

of the center line; i.e., it appears that you are making consistent large errors which, according to the third axiom, is impossible in a process involving chance errors only. This leads you to check on the process and you find that a fan has been blowing your pencil off its course, the cause of the *non-chance errors*.

In other words, by plotting the distribution, you saw at once that something, *not chance*, was operating to throw off the results. You went into action at once, located the source of trouble, the fan, and removed it. *This is the basic idea of statistical quality control.* Furthermore, with a good knowledge of the process involved, the curve that you plotted helped you *locate* the source of your trouble, telling you that the fan was on the left side of the room.

Now if you take any process subject to chance errors and think of it as a pencil experiment, a normal curve can be obtained for it. If the process is followed from day to day, anything that occurs in it that is not normal, shows up at once and steps can be taken immediately to discover the cause and remedy the situation before it becomes worse.

It may be asked, how can the results of such a simple experiment as the pencil dropping experiment be applied to a complex manufacturing process? In the pencil experiment there was only one essential variable, the quality of the aiming. In a manufacturing process there may be many variables, each completely or partially independent of the others. The reason it can be applied is that, regardless of whether there are one or many steps in a process, as long as the errors that occur at each stage are only of a chance nature, then the sum of all the chance errors will still present a distribution curve of the type obtained from the pencil experiment. This is a proven mathematical fact, the proof of which need not concern us here. But it is a reasonable one, because when you think of it, even the simple quality of aiming in the pencil experiment is made up of many other factors, such as the focusing quality of one's eyes, the uniformity of the release, the uniformity of the pencil, and so forth.

Thus, we can quality control at any stage of the process, or on the final product, depending on which is most advantageous to us. In some processes we may be interested in a specific step, in others in the com-

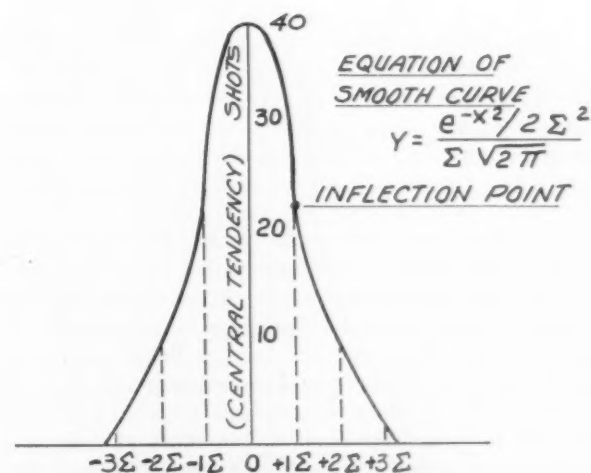


Fig. 3. Smooth curve for 1000 shot trial.

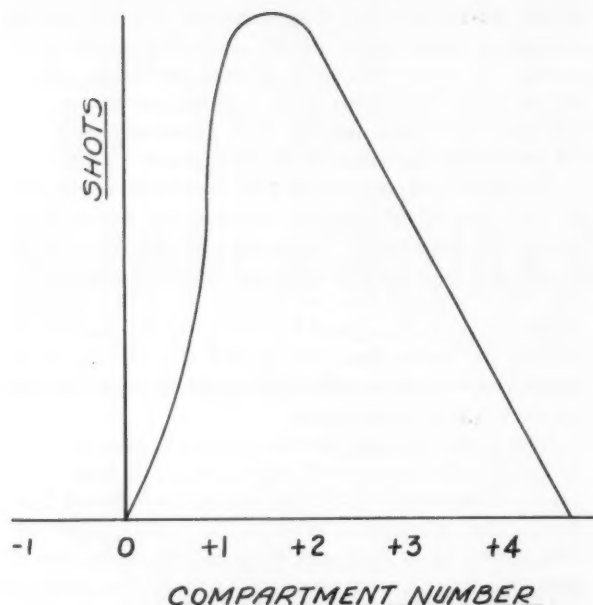


Fig. 4. Pencil experiment results with fan flowing across paper.

posite of them all. So we can select either a specific quality of the product that can be measured or a composition of qualities which may be taken as an overall index.

How Are Operating Limits Established?

Let us go back to the pencil experiment once more. If you were an expert marksman, your normal curve would look like curve A in Figure 5. It shows that most of the shots are on the beam, that the chance of making a large error is very small (the curve is not spread out). On the other hand, a poor marksman would have a normal curve looking like curve B. He is pretty near likely to make poor shots almost as often as he makes good ones, as indicated by the curve. We say his curve has a bigger *scatter* or *spread*. In other words, the smaller the spread, the better the chance of finding the shots "on target."

You get similar results when you plot normal curves for a given process. The nature of the process may be such that you get a wide spread. This will sometimes occur in barrel plating, with a poorly designed barrel, or with a good barrel and a poorly designed plating solution, where it is found that a close thickness tolerance cannot be held.² This is a basic fault which can only be corrected by redesigning the barrel or changing the solution, depending on what an analysis of the distribution curve and the pertinent facts show. And this points out another advantage of statistical analysis. It enables us to improve our marksmanship!

As a measure of this *spread* we use the Greek letter Sigma (Σ). Sigma is a simple symbol for a fancy statistical title, *Standard Deviation*. It represents the distance out from the center line of the curve (also called the "Central Tendency" or "Average Value"), as seen in Figure 3, to the point where the curvature changes from concave down to concave up (inflection point). To put it in another way, if you think of a female shape, the distance between the centerline and the point where the waist ends and the hips begin, is

Sigma, the measure of the spread, or standard deviation. If Sigma is large then the spread will be large. If Sigma is small then the spread will be small.

The reason Sigma makes a good measure of the marksmanship is this: the area under the normal curve represents every possibility. Thus to go back to the bar chart originally plotted, one hundred shots were taken and the shots were distributed as shown in Table 1. According to the table, the chances of landing

Table 1

Compartment #	(Experimental Results) Shots in Compartment
-3	1
-2	4
-1	24
0	40
+1	25
+2	5
+3	1
Total 100	

a shot in the 0 compartment would be 40/100 or .40; the chance of landing a shot in the +1 compartment would be 25/100 or .25, and so on. It can be seen then that the sum total of all these fractions will add up to one, which represents every possible case. Going to the smooth curve which results from many trials using narrower compartments, it can be seen that the height of a compartment, which represents the number of shots in that compartment, multiplied by the unit width of the base, is the area under that particular part of the curve. Thus, the area under the curve between two given points, is a measure of the probability of one's hitting the target between those two given points.

Now it can be shown mathematically that the area under this curve between plus and minus Sigma is 68.3% of the total area under the curve, or the bulk of the area. If Sigma is small, the curve will look like 5A and, if Sigma is large, the curve will look like 5B, the total area under both curves being exactly the same, namely unity.

If we go out to 2Σ in either direction from the center line the area under the curve to this distance will

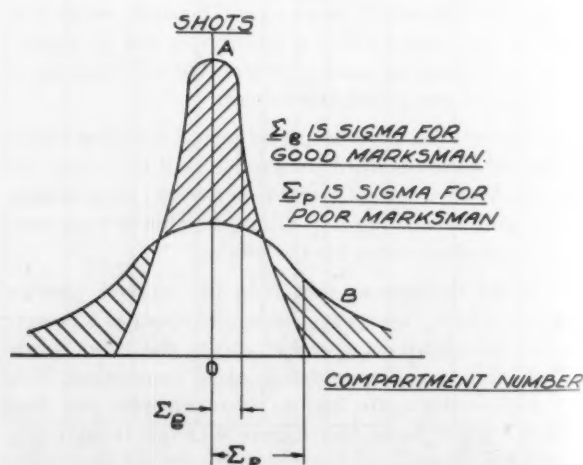


Fig. 5. Shot distribution for A) good marksman B) poor marksman.

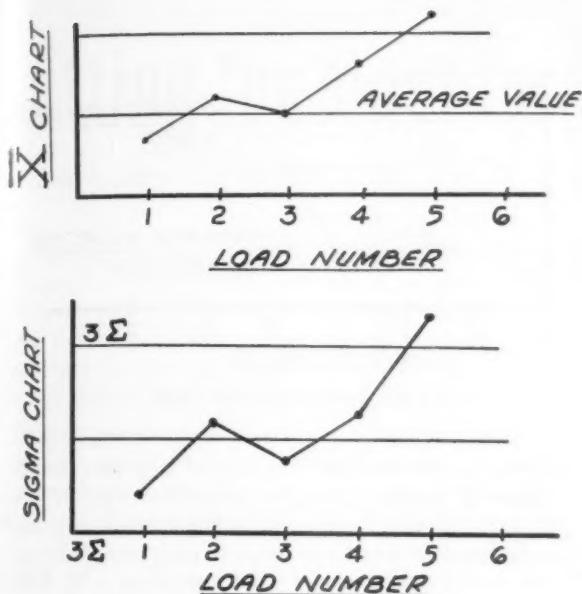


Fig. 6. \bar{X} & sigma chart.

be about 95.4% of the total area. And if we go out a distance 3Σ along the curve, the area under it will be 99.7% of the total, which covers about all possible cases. This explains why 3Σ is taken as the upper and lower limits for a process, because these limits cover nearly every possible chance result.

Now in an actual manufacturing process it would be out of the question, if not impossible, to plot a distribution curve such as those shown, by recording every measurement. It would be too time consuming and the result would be worthless by the time we got it! However, if we took a good sized sample lot and made measurements on it and found that the distribution of the measurements followed the normal law, we could safely assume that the whole output follows that law, just as in the pencil experiment you could intuitively see that an increased number of shots would fall within the same general pattern. In the pencil experiment for example, even if one made a test with a thousand shots, it could safely be predicted, based on what was known from the one hundred shot test, that four out of every ten shots would fall in the zero compartment area or that, out of a total of one thousand shots, four hundred would be on target. Actually, it would vary a little from this if all the results were to be counted, but it would be close enough to the truth to save the nuisance and bother of having to count everyone of the four hundred (more or less) shots in the zero compartment.

This is the general idea of the sampling method used for quality control. We try to use a minimum number of samples to obtain a maximum amount of information. There is a mathematical relationship between the size of the sample selected and the main lot which tells you how much information one has a right to expect from the sample, based on the laws of probability. This relationship has been summarized in a number of "Sampling Tables,"⁴ which are available to the manufacturer to aid him in determining just what size sample he should use in establishing quality control on a given item. Thus all that may be required in a barrel

plating process for a very good picture might be a sample lot of twenty-five, perhaps less, depending on the value of Sigma. In a tank plating process it might be a sample lot of five, likewise depending on how close we are shooting to the bull's eye. Consulting these tables will help tell what size sample should be selected for a particular process, and quantity of production.

Determination of Sigma

To actually determine what Sigma is, we take the random sample lot decided upon and make the measurement on them in which we are interested. First we add up the measurements and divide by the number of measurements taken. This gives us the *Average Value* or *Central Tendency*. Then, if X_1, X_2, X_3 , up to X_n are the actual values of the n measurements and \bar{X} is the average value, Sigma is equal to,

$$\Sigma = \sqrt{\frac{(X_1 - \bar{X})^2 + (X_2 - \bar{X})^2 + (X_n - \bar{X})^2}{n - 1}}$$

This looks complicated but actually isn't; usually these figures can be worked up with a slide rule or a computing machine in a matter of minutes.

Let us now take a working example, a production job involving the plating of a hemispherical shape with silver (a reflector). The specification says we must have 0.0005" of silver at the bottom of the reflector with a tolerance of plus or minus 0.0001". Tests are now made using a sample lot of ten selected at random, according to a sampling table procedure. The Sigma, as calculated from the samples, is 0.0001. This means that on the average, for any given load of 100 reflectors under the same plating conditions, only 68.3% or 68 reflectors will be within the specification. Accordingly the racks are redesigned or placed differently in the tank until an arrangement is reached which gives a Sigma value of 0.00005. This means that all work within plus or minus two Sigma will be within tolerance

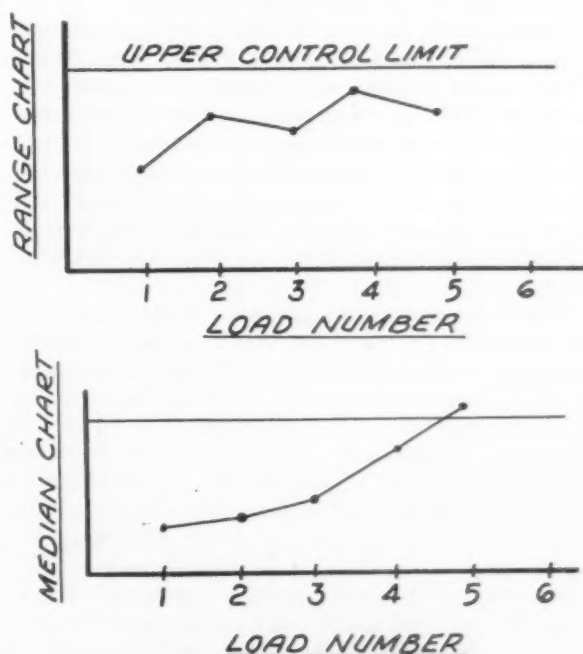


Fig. 7. Median & range chart.

and therefore we can safely assume 95 to 96 of the reflectors in each production lot will be satisfactory.

To control the process once we have set the correct production method up and have set the limits, we may work with an even smaller sample, say five items from each load. We measure the thickness (non destructively) and plot the results on a quality control chart, as shown in Figure 6.

As soon as the control chart goes above or below 3σ , or shows a definite long trend up or down, the operation will be stopped and a search made for the cause and the fault corrected. Thus, in the chart shown, the process went out of control at the fifth load because the mechanism used to time the plating went out of order and overtuned the plating operation.

The method that has just been outlined is one of the basic ways in which quality control is used. There are sometimes simpler ways for doing the same thing so that long involved computations are not required. Thus, instead of plotting standard deviations, we can plot the *Range*, which is also a measure of the spread or scatter but not a too accurate one. The range is simply the difference between the largest and smallest measurement of a series. Thus, for example, if we took four measurements and found the values, 12, 16, 16, 20, the range would be $20 - 12 = 8$. The average value

for the measurements would be
$$\frac{12 + 16 + 16 + 20}{4}$$

$= 16$. Another set of measurements on a similar process might be 14, 16, 16, 18, which gives the same average of 16 but a smaller range, namely 18-14 or 4. Obviously, the second process which shows a smaller range is the more desirable one because the results will be more often "on target." While a range chart (R chart) is not as accurate as a deviation chart, it will often serve the purpose and save a lot of calculation. However, when data is hard to take or expensive to come by, a Sigma chart is best because more definitive information is obtained with it.

Sometimes, to cut corners even further, an average need not be figured for a plating process result. Thus, if five samples are taken say, the *Median* value found is considered to be the average value. The *Median* value is simply, as the name implies, the one closest to center. Thus, if in five measurements we found values of 20, 19, 18, 21, 21, the median value would be 20. As you can see it is a rough approximation to the average value. We could thus plot median values as shown in chart 7.

Another type of chart, also based on the same normal distribution curve, is the percent or fraction defective curve, sometimes known as a P chart. Here what

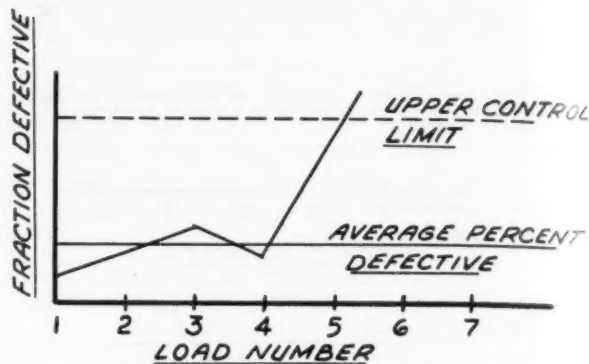


Fig. 8. Fraction defective chart.

is plotted is the fraction defective of a given sample lot taken at random from the production run. If the normal distribution shows that on the average you can expect a maximum of three items in each sample lot of 20 say, to be defective and a lot comes up with four or five, the process has gone out of control. This type of chart is represented in Figure 8.

In this short article we have covered a lot of territory but it is believed that an idea has been given of what Statistical Quality Control is about; at least enough so that you won't feel like a wall flower when someone flings the words "Standard Deviation," "Sigma," and "Central Tendency" around. In closing, it should be repeated once more than S.Q.C. is not a plating panacea. It will help only if its principles are consistently applied. This means an actual day to day record with the charts visible to everyone concerned. If you are just going to make an occasional test when the mood strikes or post the results where no one can see them, you can forget the whole thing. On the other end of the rope is the super quality-control-minded fellow who, to mix a metaphor, cannot see the forest for the statistics. He is so intent on quality that nothing gets done! So if you are going to apply it, choose the happy median.

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Getting the Most for Your Polishing Dollar?

By Edwin F. Doyle, Barker Bros., Inc., Brooklyn, N. Y.

ONE may think he is getting the most for the dollars spent in his polishing operation. However, listed below are some of the less obvious factors concerning buffs that eat up savings made in other places. These important factors, given proper consideration, make the big difference between one buff and another.

These deviations occur chiefly from manufacturing practices and technical knowledge of the companies who make the buffs. They can be broken down further into three general categories.

(1) *Deliberate:*

- Substitute material used
- Shortage of ply
- Large cuts in full discs
- Skimping on material on bias buffs
- Diameter not full size as specified

(2) *Faulty practices resulting from lack of manufacturing knowledge and experience:*

- Improper turning
- Not in balance
- Not properly centered
- Sewing thread not satisfactory for job
- Failure to supply buff exactly as specified
- Bufs not uniform in every way each order

(3) *Faults due to lack of technical knowledge and progressive engineering:*

- No consideration of uniformity of material used
- Improper storage of material to prevent deterioration
- Bufs not pre-finished
- Old or inferior grades of material used
- Worn out or out-dated machinery used in the manufacture of the buff
- Improper type of machinery used in the manufacture of the buff
- Old methods used in the manufacture of the buff

(In this category there are many small ways that modern progressive practices add to the value of a buff)

Let's be more specific and consider the deliberate practices. Every buff salesman who represents a reputable company can recite many instances where he has found deliberate cloth substitution in a less reputable manufacturer's buff. Is it deliberate? Definitely! A buff company doesn't buy substitute materials that are almost the same but not quite as good unless they intend to substitute it. There's always a quick apology and the explanation that it slipped into the buff by mistake. The fact remains that they wouldn't have bought the material in the first place if they weren't going to substitute.

Substitutes and Shortages

Are substitutions easy to detect? Many times not. Standard buff weight 64/64 material should have 3.15 yards to equal one pound. Substitutions are the same thread count except lighter in weight. Most common substitution on this cloth is a 64/64 material requiring 3.50 yards to equal a pound. This is a difference of 10% in cotton content. It is difficult to detect by observation even to the experienced eye. If it is used only in the center plys of a buff, it is even more difficult to spot. Due to the fact that cotton takes on and gives off moisture with the changes in relative humidity, the weight of a stack of buffs may vary slightly from day to day. One thing is certain. The wear from the substitute material will definitely be less. More compound will be used on a given number of pieces and the labor per piece will be higher. The increased total cost of polishing, per unit item, will more than offset any saving on purchase price.

These substitute materials are used by less reputable manufacturers on all the standard buff numbers. There are similar materials, usually lighter in weight, that can be obtained and substituted for each standard cloth. A buff manufacturer with a good reputation will not use these materials even though they may be cheaper, because he knows that, in the final analysis, the results will be more costly to the consumer.

Shortages of ply are also costly. What does one ply amount to? Put in these words it doesn't sound like too much. On a 20 ply buff, however, it is equal to 5% in actual cost. If one is using a number of sections to make up a wheel, it makes a wheel with 5% less surface. This means a longer labor time, a factor which must be considered with the initial cost of the buff. Just compare, for example, monthly buff costs with monthly labor costs for polishing. The labor cost is pretty high isn't it? Every opportunity should be taken to decrease it. It is a definite item for consideration in purchasing.

In all the other deliberate practices that rob the user of buff value, the same facts apply. If there is less good, first rate cotton in the buffing wheel, it is going to wear down faster and take more labor per finished piece.

For a change in reading, let's take some actual figures that could apply to anybody. One purchases a 12" x 20 ply buff. The buffs are shipped in measuring only 11 $\frac{3}{4}$ " in diameter. One-quarter inch on a 12" buff doesn't seem to be too great a difference particularly if the price is 5% cheaper than the nearest legitimate competitor.

Let's look at the actual difference in what was received. Remember, we are dealing in areas which are proportional to the square of the diameter. We are also going to throw away part of this buff when it wears down to approximately 7" in diameter. We will

make the comparison in percentages which can be substituted into any specification of buff regardless of type material or ply.

	12" Dia.	11 $\frac{3}{4}$ " Dia.
Total Area	113 sq. inches	108.25 sq. inches
Area of 7" thrown away	38.5	38.5
Total Usable Area	74.5 sq. inches	69.75 sq. inches

Difference = 4.75 square inches or 6.4% less usable buff in an 11 $\frac{3}{4}$ " buff.

There goes the five percent saving in price PLUS the very important fact that it was stolen from the outside of the buff where the labor time is less because of faster cutting speed. It's like taking the cream off the top of the bottle before you get your milk, isn't it?

A person gets very annoyed to have some one take deliberate advantage of him. Nobody likes to have his pocket picked. Just as costly, however, are losses occurring, quite innocently, due to inexperience and careless manufacturing by buff companies.

Results of Lack of Know-How

To give an even wearing buff, the plies must be turned to have the threads of each succeeding disc approach the periphery radially at a different point on the buff. A buff with all plies having the warp and weave going the same direction will fray out fast on the four sides where the thread approaches the edge on a right angle. On a loose buff if the discs are not properly turned, buff wear will be decreased over 10%. If you don't believe it, ask your buff man for an unturned sample and try it! It will also be seen that it doesn't do either as good or as fast a job.

Bufs out of balance? A slower job and much more fatiguing to the polishers. Poor balance causes faster machine wear. Bearings and shaft wear faster. Finally, since uneven pressure will result, the buff will give less production per wheel. Don't forget to add in loss of labor and machine wear.

If the buff isn't properly centered, add on the time to rake the buff down even and consider the area lost. It may raise the cost of the buff five to ten percent.

The cost of the sewing thread that goes into sewed bufs is very small compared to the price of the buff. If the wrong thread is used, the manufacturer can save perhaps one-half of one percent. However, it may cost the consumer a great deal more. Faster buff wear alone could eat up five to ten percent of the price, not to mention the labor lost through a slower operation.

Other instances of faults due to lack of manufacturing know-how, are happening every day. These little things, inconsistencies and deviations from the best manufacturing methods, all cost the polisher precious dollars. They may not be intentional, the supplier may be honest, but it still contributes to waste costs.

Lack of Technical Knowledge

Technical knowledge of the buff manufacturer helps keep the polishing cost down. Naturally some are always ahead in technical knowledge and others copy the more obvious advantages when it becomes necessary. There is, however, much technical know-how that cannot be seen to be copied.

An example of this is the consideration of the sources of supply of raw materials. Those familiar with textile markets know that some mills produce better goods, more consistently than others. These mills in turn buy

better cotton fiber with greater strength.

Old cotton goods becomes brittle, the oil evaporates and, particularly in bufs, will wear faster. Brittle cotton made into a standard buff cloth will not give as much buff wear as the same cloth made from first grade cotton. Three news articles appeared at different times in the cotton textile industry's daily paper, the Daily News Record, in the Fall of 1953. Summed up individually, they were as follows:

- (1) Drought in cotton growing areas in the Southwest result in inferior fibers.
- (2) Some mills refuse to use Southwest cotton.
- (3) Some mills are adding clauses in their contracts, disclaiming responsibility on their products.

Put together, it means that some mills are using the inferior fibers and others aren't. Those using it won't even stand behind their goods. Naturally they can sell goods cheaper because the cost of the inferior fiber is less. This material should not go into bufs because, in bufs, it is subjected to the most severe usage. It is then up to the buff manufacturer to determine which mills supply the best grades of cloth. These mills are usually slightly higher in price, but the difference in fabric warrants it, particularly for bufs.

Technical advancement has been recognized as a necessity in all modern industry. The buff industry is no exception. Up-to-date buff engineers, working together with polishers in the industry, are developing new ideas and techniques all the time. These are incorporated into bufs to make them better and more versatile. Buff companies who are not constantly developing are behind the times and it may be costing their customers precious dollars.

Factors that have to be considered in arriving at the polishing cost include the following:

Amount of compound used; amount of labor used; machine "down time"; breaking in wheel time and type of finish produced; and last, but definitely not least, is the buff used because it can affect every one of the other factors. Buff price is not alone the deciding factor.

Getting Most For the Money

And now the most important question — "How can the buff purchaser get the most for his money?"

First, it must be realized that there is a decided difference between bufs manufactured by one company and another. Look into the background and reputation of the sources or potential sources of supply — they are supplying an important tool. Dependability is a characteristic, not a commodity. Determine one or more good dependable sources and deal only with dependable manufacturers.

Second, make full use of all the technical knowledge that dependable representatives can give. Today, buffing operations are taking only a fraction of the time they did 15 years ago. A good buff man knows his product and what it will do. He will be glad to give the user all the time required.

The reliability of the sources of supply, plus making full use of the services they are glad to give, will do more to cut polishing costs than any other factor. Beware of the manufacturer who offers to give the same thing for less. It is not and cannot be the same. There is no substitute for quality.

The Determination of Nickel in Nickel Plating Solutions

Using Disodium Ethylenediamine Tetra-Acetate

By K. E. Langford, A.R.I.C., A.I.M., Chief Chemist, Evered & Co. Ltd.

THE three most widely used methods for the determination of nickel in plating electrolytes are:

- (a) Electrolysis.
- (b) The cyanide/silver nitrate titration.
- (c) Precipitation and weighing as the glyoxime complex.

The electrolytic method is reliable with all types of dull nickel solutions but, in the presence of certain brighteners and levellers, there is sometimes difficulty in removing all the metal from the electrolyte. This can be overcome by oxidation and fuming of the solution with concentrated sulphuric acid but the time required for the determination is lengthened considerably. In the case of cobalt/nickel solutions, the cobalt is also included in the deposit and allowance must be made for this. It is found that the method yields slightly high results probably due to the inclusion of nickel hydroxide in the deposit, since plating takes place from a strongly ammoniacal electrolyte. It has been shown that this substance is present in deposits made from solutions working at the conventional pH of 5.6-5.8.

The cyanide titration method is rapid and reasonably accurate but suffers from the disadvantage that the titrant (sodium or potassium cyanide) is unstable and must be standardized before each new series of titrations. A further objection is its extreme toxicity.

The gravimetric procedure, in which the nickel is precipitated as the red dimethylglyoxime complex and weighed on a sintered glass crucible, is probably the most accurate method known for this determination since cobalt and most other metals do not interfere. The only objection to its use is the time employed in carrying out the double weighing and the filtration of a large bulk of solution through a small capacity sintered glass crucible.

The titration of certain metal ions, particularly calcium and magnesium, has been previously described¹ and methods for plating solution analyses employing these techniques have been developed by the author.^{2,3} The applicability of the method to metal ions other

than calcium and magnesium depends on the discovery and exploitation of suitable indicators sensitive to the presence of the particular ion being titrated. So far only two such indicators are widely employed, namely, eriochrome black T and murexide (ammonium purpurate), sensitive to magnesium and calcium ions respectively.

It has been shown that murexide is also sensitive to nickel ions so that under the correct conditions it would appear to be possible to titrate nickel with E.D.T.A. Since this reagent is very stable and non-toxic it seemed that a method based on its use could replace the cyanide titration. Accordingly a series of experiments was designed to study the optimum conditions for the titration of nickel ions.

Experimental Work

A stock nickel solution was prepared from the following constituents, using the purest salts obtainable:

NiSO ₄ ·7H ₂ O	32.0 oz./gal.
NaCl	4.0 "
H ₃ BO ₃	4.0 "

The nickel content of this solution was then determined using both the gravimetric and electrolytic methods, with the following results:

Electrolytic method	34.49 oz./gal.
Gravimetric method	33.98 "

Murexide indicator gives a reddish-brown coloration in the presence of calcium ions at a pH of 12, while in their absence, i.e., after complexing with E.D.T.A., the color is violet-blue. Preliminary experiments showed that nickel ions behaved similarly although it was impossible to work in a solution of sodium hydroxide (as in the case of calcium) because nickel hydroxide is thrown out at such a high pH. However, working with a strongly ammoniacal solution, and in the absence of other ammonium salts, the color change was sharp when all the nickel was complexed. In the presence of large quantities of ammonium chloride or sulphate the end point was less definite, no doubt due to the reduction in pOH resulting from the common ion effect.

Using a 2 ml. sample of the stock solution, 100 ml. water, 10 ml. concentrated ammonia and ½ g. mur-

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oxide indicator (see Reagents, towards the end of this paper), it was found possible to titrate the nickel solution using N/5 E.D.T.A. The concentration of nickel sulphate in the stock solution found by this method was:

$\text{NiSO}_4 \cdot 7\text{H}_2\text{O}$ 33.71 oz./gal.

This shows excellent agreement with the gravimetric method and is probably more accurate than the electrolytic procedure for the reasons previously discussed. The titration can be performed to within 0.05-0.1 ml. of the titrant, equivalent to 0.22 oz./gal. $\text{NiSO}_4 \cdot 7\text{H}_2\text{O}$, under the conditions outlined. This is sufficiently accurate for all practical purposes.

The method was applied to four Watts-type nickel solutions in a plating shop under the author's control, and the results are given below for $\text{NiSO}_4 \cdot 7\text{H}_2\text{O}$ content:

(1)	By E.D.T.A.	38.66 oz./gal.
	" electrolysis	39.80 "
(2)	By E.D.T.A.	51.92 oz./gal.
	" electrolysis	52.60 "
(3)	By E.D.T.A.	45.62 oz./gal.
	" electrolysis	46.40 "
(4)	By E.D.T.A.	43.60 oz./gal.
	" electrolysis	44.40 "

In view of the suspected high results obtained by electrolysis, the agreement was considered sufficiently good to allow the method to be employed for all control purposes.

Application to Bright Nickel Solutions

Experiments were next carried out using bright nickel electrolytes of the organic type employing *p*-toluenesulphonamide and saccharin as brighteners, and coumarin as leveller. Results for $\text{NiSO}_4 \cdot 7\text{H}_2\text{O}$ were of a similar order of accuracy and are given below:

(a)	By E.D.T.A.	33.27 oz./gal.
	" electrolysis	34.15 "
(b)	By E.D.T.A.	41.80 oz./gal.
	" electrolysis	43.40 "
(c)	By E.D.T.A.	36.18 oz./gal.
	" electrolysis	37.40 "

As a further check, 2 ml. of stock solution were diluted with 100 ml. water and saturated with both brightener and leveller before titrating with N/5 E.D.T.A. The correct result was obtained demonstrating conclusively that the new method was applicable to this class of bright nickel solution.

Interference was expected from both cobalt and magnesium, from the former because its chemical properties are closely allied to those of nickel and from magnesium because it is readily complexed by E.D.T.A. although it does not affect the murexide indicator. Experiments were carried out to investigate the effect on the titration of these two metals.

In the case of cobalt it was found that the metal titrated (complexed) with E.D.T.A. and also gave the murexide end point similar to nickel. Although the alkaline solution of cobalt is more highly colored than

that of nickel, the color gradually fades as the metal becomes complexed so that the end point is identical with that obtained when titrating nickel. A solution of the mixed sulphates of nickel and cobalt titrated with E.D.T.A. gave an excellent end point, the result being the exact total of the two metals. Clearly, therefore, in a cobalt/nickel bright solution, the cobalt would be reported as nickel.

It is known that the compound resulting from the addition of excess ammonia to the solution of a cobalt salt is a cobalt amine, one of a series of complex substances formed in this manner under varying physical conditions. The metal is present in the trivalent (cobaltic) condition combined as a complex cation $\text{Co}(\text{NH}_3)_6$ which gives none of the reactions of either cobaltous or cobaltic ions. The formation of this complex amine is hastened by the addition of oxidizing agents, the color of the solution changing from brown to pink. It was therefore concluded that if the solution of mixed ions, cobalt and nickel, was oxidized in the alkaline condition, then the cobalt would be complexed and hence not titrated by the E.D.T.A. solution. Nickel is unaffected by the oxidation and would be expected to titrate in the normal manner.

Varying amounts of N/5 $\text{CoSO}_4 \cdot 7\text{H}_2\text{O}$ were added to 2 ml. samples of stock nickel and an attempt made to oxidize the ammoniacal solution. This was achieved successfully by boiling with ammonium persulphate until most of the oxygen was evolved, after which the solution was cooled and titrated with E.D.T.A. solution. Nickel was accurately titrated in the presence of the complexed cobalt, thus dispensing with the necessity of difficult chemical separation. A method for determining nickel in cobalt-nickel electrolytes was worked out on this basis.

It is theoretically possible to determine the cobalt by difference, i.e., by titrating the mixed metals on one sample and the nickel on a second volume. However, this means that the cobalt figure is a small difference between two large readings, leading to the possibility of errors, and the procedure is not recommended.

Effect of Magnesium

Interference from magnesium would only be serious in solutions to which deliberate additions of magnesium sulphate has been made; the small concentration found in tanks employing depassive anodes could be ignored. As the new method would be even more valuable if it could be employed in all types of nickel solutions, the effect of magnesium additions was investigated fully.

It has been stated that the magnesium complex of E.D.T.A. is much more stable than that with nickel so that in a mixed ion solution the magnesium should complex first and leave the nickel to be titrated in the usual manner. In practice, it was found that, when titrating the mixed metals, the end point with murexide either failed to appear or was very indefinite; Mg^{++} must in some manner affect the indicator. No simple reagent is known which will complex magnesium, nor is it readily precipitated, being unaffected by the five ordinary group reagents. Removal by ammon-

ium phosphate can be accomplished but it is time-consuming if complete precipitation is desired. It was shown that if the magnesium was precipitated by ammonium phosphate in the alkaline solution before titration, a reasonable end point could be obtained, but the results were always low. This was thought to be due to co-precipitation of nickel phosphate. By precipitating the magnesium at the boiling point and cooling, the co-precipitation was considerably lessened but the end point was never as sharp as when employing nickel salts alone. With practice and in daylight, experience would enable an operator to obtain results of sufficient accuracy for rough control purposes. It seemed that the ammonium salt was affecting the end point, so sodium phosphate was used instead, but, surprisingly, the indicator failed to change at all under these conditions. The reason for this is unknown. Although not recommended, the method for use in the presence of magnesium salts is included to stimulate further investigation.

Recommended Methods

IN THE ABSENCE OF CO AND MG:

Pipette 2 ml. of the plating solution into a 5 in. porcelain dish and dilute with approximately 100 ml. water. Add 10 ml. concentrated ammonia and approximately $\frac{1}{2}$ g. murexide indicator. Titrate the solution with N/5 E.D.T.A., stirring constantly until the neutral brownish color of the solution changes to a bright bluish-violet. Time 5 minutes.

IN THE PRESENCE OF CO AND ABSENCE OF MG:

Pipette 2 ml. of the plating solution into a 5 in. porcelain dish and dilute to 100 ml. with water. Add 10 ml. concentrated ammonia and 1 g. ammonium persulphate and raise to the boil, maintaining at that temperature until no further color change takes place (3 min.). Cool to room temperature, add 10 ml. ammonia and $\frac{1}{2}$ g. murexide indicator. Titrate with N/5 E.D.T.A. until the pinkish-brown shade of the liquid changes to a bright blue-violet. Time 10 min.

IN THE PRESENCE OF MG AND ABSENCE OF CO: (EXPERIMENTAL METHOD)

Pipette 2 ml. of the plating solution into a 5 in. porcelain dish and dilute to 100 ml. with water. Dissolve 1 g. sodium citrate in the solution and add 20 ml. concentrated ammonia. Raise to the apparent boil (evolution of NH_3) and slowly add a hot solution of 1 g. ammonium phosphate dissolved in 20 ml. water. Well mix and cool to room temperature. Add 1 g. mur-

exide indicator and titrate with N/5 E.D.T.A. until the bluish-violet color which appears as the end point approaches undergoes no increase in intensity or change in shade. The color change during titration is from orange-brown, through pinkish-brown and purple to blue-violet. Daylight is essential for this titration.

CALCULATION:

$$\begin{aligned} 1 \text{ ml. N/5 E.D.T.A.} & \equiv 0.02809 \text{ g. NiSO}_4 \cdot 7\text{H}_2\text{O} \\ & \equiv 0.02629 \text{ g. NiSO}_4 \cdot 6\text{H}_2\text{O} \end{aligned}$$

On a 2 ml. sample,

$$\begin{aligned} \text{Ml. N/5 E.D.T.A.} \times 2.248 & = \text{oz./gal. NiSO}_4 \cdot 7\text{H}_2\text{O} \\ \text{" " " " } \times 2.103 & = \text{" " NiSO}_4 \cdot 6\text{H}_2\text{O} \end{aligned}$$

Reagents

MUREXIDE INDICATOR:

This substance is correctly known as ammonium purpureate. Due to its instability it cannot be employed in either aqueous or organic solvents. It is normally employed in the solid state diluted with some neutral salt. The indicator is made by grinding together 0.2 g. ammonium purpureate and 100 g. pure sodium chloride until the organic compound is intimately mixed throughout the mass. Store in a brown bottle away from the light.

N/5 E.D.T.A.:

For this determination the reagent can conveniently be standardized against reagent quality nickel sulphate. Dissolve 38 g. of the disodium salt in distilled water and make up to 1 litre in a standard flask. Standardize under the exact conditions outlined in the first method using a suitable weight of pure nickel sulphate dissolved in the 100 ml. of water. The reagent may also be standardized as given in the author's previous article on magnesium in nickel solutions.² This technique necessitates the use of another indicator and will be more useful for those already employing E.D.T.A. for the determination of magnesium.

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An Up-to-Date Job Shop

IN the depression days of the thirties, Ray Grunwald landed his first production job as a polisher, considering it an advance over selling newspapers. Now, two decades later, as president of his own firm, Grunwald Plating Co., he controls the destiny of one of the largest and most efficient job shops in the Chicago area, with three plants equipped with the most modern equipment.

Ray is not resting on his laurels, however, but continues in his efforts to promote the interests of the metal finishing industry. He acts, when necessary, as a representative of the industry on a national basis in Washington and is presently serving as co-chairman of the Committee for Educational Development of the Chicago Electro-Platers Institute.

The technical ability of Mr. Grunwald, a pioneer in the development of Lucite plating barrels, is evidenced by the improvements to be seen in the photos on these pages of various departments of his plants.

Figure 1 shows the exterior of the main plant at 2559 W. 21st St., Chicago. This plant is equipped to electroplate cadmium, zinc, zinc chromate, copper, nickel, chromium, brass and silver. Burnishing, lacquering, oxidizing and pickling of stainless steel, as well as the polishing and buffing of all metals are also carried out in this plant. Another plant is maintained to perform hard chromium operations.



Figure 1.

Figure 2 shows the well-planned general office which greets the visitor at the main plant. In the background are two of the executive offices.

Figure 3 illustrates where research and control are carried out in a well-planned modern laboratory.

Figure 4 is a view of part of the polishing department in the main plant.

Figure 5 affords a view of the semi-automatic line, one of the few employed in job-shop plating. Work is placed in a barrel once and comes out as a finished product. All operations including cleaning, bright dipping and rinsing are performed in this one-barrel cycle in specially designed round-bottom tanks. In the foreground is the hydraulically operated final rinse and the unloading station. Metal catwalks are used throughout.

Figure 6 illustrates the conveyORIZED infra-red drying oven, which is unknown in many job shops. It is part of the cadmium line at Grunwald.

Figure 7 is a view of the section where racking is done for the chromium line.

Figure 8, in the foreground, shows the copper tanks, from which work moves to the nickel line in the background. They are part of the copper-nickel-chromium line.



Figure 2.



Figure 3.



Figure 4.



Figure 5.

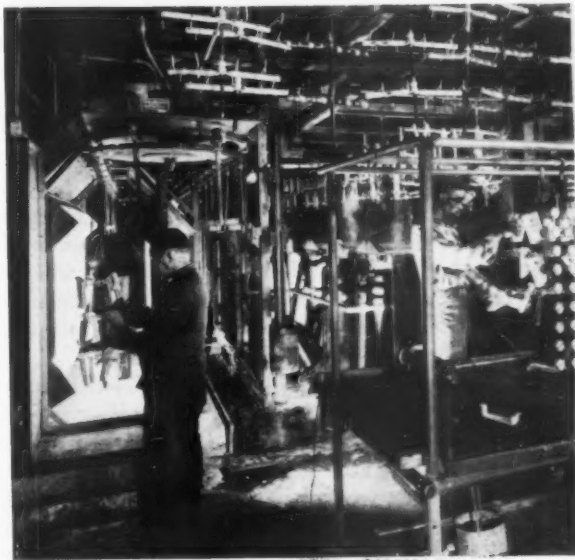


Figure 6.

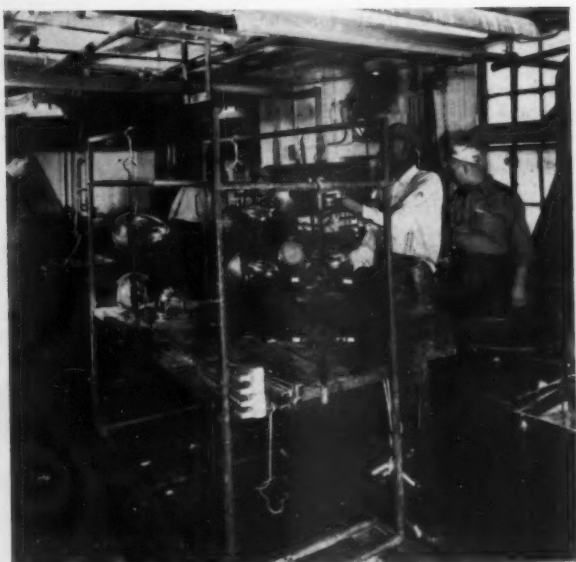


Figure 7.

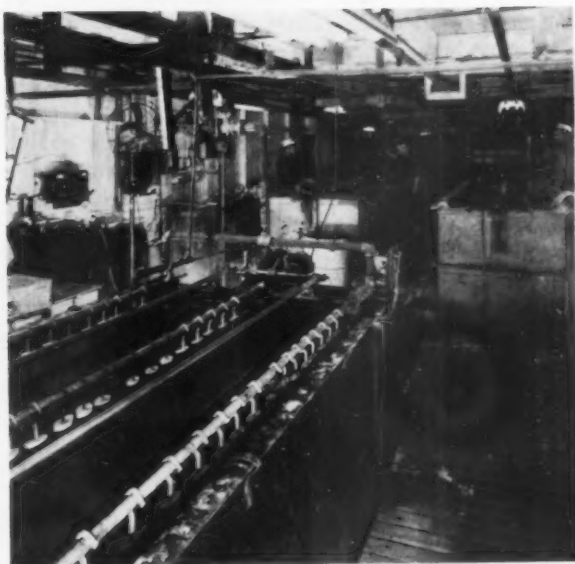


Figure 8.

Plating in the Automotive Industry: Its History and Development

By William M. Phillips

This third installment completes the series on automotive plating, which ran in our July and August issues.—Ed.

ONE might reasonably ask why the nickel scarcity cannot be removed by the production of more nickel and the answer is, a great deal more nickel was produced, but not enough. The principle deposits of nickel are in Canada, but there are further deposits in Norway and in Cuba. There are small deposits in this country. All of these sources were developed as rapidly as possible and there has been a constant improvement in the quantity of nickel available. This is fortunate because if it were not for this fact, it is doubtful whether any plating with nickel could be allowed at all.

There was developed a stockpile of nickel for defense purposes and there was a great deal of disagreement as to the proper amount to stockpile, or the wisdom of the stockpiling program. However, I think we will all agree that it is better to make a mistake on the plus side when it comes to our defense than it is to make one on the minus side.

The relations between the American Electroplaters Society and the platers of the motor industry have been very close indeed. In fact, we have had many officers in the AES who are important elements in the plating of automotive parts. This, of course, should be true on the basis of the volume of plating used by the motor industry. It was figured that in 1950, the amount of nickel used to plate automobiles would have made a belt around the world at the equator 3 ft. wide and one thousandth of an inch thick. The power used to plate with by one company would be sufficient to furnish power and light to a city the size of Syracuse, N. Y.

It does seem a very bad thing indeed that the quality of plate had to be sacrificed to such an extent during the Korean war period. The cars produced in 1950 number about 6,000,000 units, figured at \$3,000 apiece would result in a value of \$18,000,000,000. If the poorer plating resulted in a decrease in value of 10%, which I believe is conservative, the motoring public would have lost \$1,800,000,000. I think this is warning enough that our industry should strive never to get in that kind of a fix again. Personally, I do not know the answer but I have great faith in the technical ability and ingenuity of our electroplaters.

Plating Specifications

As to development of specifications on plated parts used in the automotive industry; since steel or ferrous metal parts constitute the majority of plated surface

Number 128
Date Issued 6-12-23
Replaces Issue of 3-14-21

Method SPECIFICATION

Issued by M. and S. Dept. For
NICKEL PLATING MISCELLANEOUS PARTS
At Manufacturer's Plant

General

The surface of all parts to be nickel plated must be free from scratches, deep tool marks or any other defects affecting the permanency or appearance of the nickel plated surface. All parts must be buffed free from these defects before plating or else be rejected.

Clean

Operation #1

Thoroughly clean parts by dipping in a tank of a suitable plater's cleaner, until all grease or oil is removed, then immediately rinse in clean hot water.

Copper Plate

Operation #2

Copper plate all steel parts in a copper cyanide solution for sufficient time to leave a deposit of .00015", then transfer to copper sulphate solution to produce a close grained deposit.

Buff Copper Plate

Operation #3

Buff copper plate.

This operation must not be omitted.

Note

When nickel plating brass or bronze parts it is not necessary to copper plate.

Nickel Plate

Operation #4

Nickel plate all parts for sufficient time to deposit .0010" buff.

The purchaser reserves the right to subject all nickel plated parts received to the following inspection and tests. Failure to pass any of them may be cause for the return of the shipment or any part thereof for full credit plus carrying charges both ways.

Shop Inspection

1. Samples from each shipment of nickel plated parts received will be sent to the laboratory accompanied by duplicate copies of the "Request for Test" form properly filled out, and "OK" from laboratory must be received before releasing parts to production.

Laboratory Inspection

1. The laboratory will make microscopical examination of samples submitted to determine the depth of the copper plating and nickel plating.

2. All nickel plated steel parts will be subjected to a water spray test for 15 hours and must show no signs of corrosion. If found not to conform to these specifications the shipment will be rejected, and a report submitted to the purchasing department for disposition of the rejected material.

Figure 12. First specification for nickel plated parts requiring a water spray test.

CHRONOLOGICAL DEVELOPMENT OF SPECIFICATIONS FOR NICKEL AND CHROMIUM PLATING ON FERROUS METALS

Years	Interior Parts				Salt Spray Test Hours	Exterior Parts				Salt Spray Test Hours
	Thickness of Plate, Min. Inches			Total Copper Plus Nickel		Thickness of Plate, Min. Inches			Total Copper Plus Nickel	
	Copper	Nickel	Chromium			Copper	Nickel	Chromium		
1921 - 1926						.001	(1)	(1)		16
1927 - 1928 Optional						--	.0002	--	.000016	16 (1)
						.0004	--	--	.0002	16
1928 - 1929	Required		.00027(2)	(3)	8	Required		.00027(2)	(3)	50 (4)
1929 - 1930	Required	.00027(5)	--	.00002	8	Required	.00027(5)	--	.00002	50 (4)
1930 - 1931	.00024	.00024	.00072	.00001	8	.00024	.00024	.00072	.00001	50
1931 - 1936	.0002	.0003	.0005	.00001	8	.0004	.0004	.001	.00001	50
1936 - 1941	(6)	.0003	.0005	.00001	24	(6)	.0004	.001	.00001	50
Feb. '41 to July '41	--	.0002	.0005	.00001	24	--	.0003	.001	.00001	50
July '41 to Jan. '42	.0006	--	--	.00001	24	--	.0002	.001	.00001	50
1946 to 1949	--	.0003	.0005	.00001	24	--	.0004	.001	.00001	50
1949 to 1951	--	.0003	.0005	.00001	24	--	.0009	.001	.00001	50
1951 to 1952	.0003	--	--	.00001	24	.0005	--	--	.00001	(8)
1953 to Date	.0003	.00005	--	.0001	24	.0005	.00005	--	.00001	(9)

EXTERIOR PARTS - EXTREME SERVICE

Years	Thickness of Plate, Min. Inches				Salt Spray Test Hours
	Copper	Nickel	Total Copper Plus Nickel	Chromium	
1927 - 1928 Optional				Same as Exterior Parts	
1928 - 1929				Same as Exterior Parts	
1929 - 1930				Same as Exterior Parts	
1930 - 1931				Same as Exterior Parts	
1931 - 1936				Same as Exterior Parts	
1936 - 1941	(6)	.0004	.00125	.00001	96
Feb. '41 to July '41		.0003	.00125	.00001	96
July '41 to Jan. '42		.0002	.00125	.00001	96
1946 - 1949		.0004	.00150	.00001	96
1949 - 1951		.00125	.00150	.00001	96
1951 - 1952		.0006 (7) Min.		.00001	72 (10)
1953 - Date		.0006 (7) Min.		.00001	72 (10)

NOTES:

- (1) Ferroxy test and resistance to tarnish in weathering test also specified.
- (2) Thickness of total plate specified as .2 oz./sq. ft.
- (3) Chromium specified as 5 minutes at high current density.
- (4) 30 days weathering test also required.
- (5) Thickness of nickel plate specified as .2 oz./sq. ft. 30 days weathering test also required.
- (6) Copper plating not required, but may be used to make up all or part of difference between .0004" nickel and .00125 total plate.
- (7) .001 average nickel thickness also required.
- (8) .00075 minimum thickness of enamel also used.
- (9) .0005 minimum thickness of lacquer also used.
- (10) Coating of clear wax emulsion also required.

Figure 13.

GENERAL MOTORS CORPORATION

Ferrous Metal Specifications

G.M.C.
4251-M

Specifications For Nickel
Plated Steel or Iron Parts

- CLASS A Nickel plated steel parts shall withstand 24 hours in a salt spray test without appearance of rust on significant surfaces.
- CLASS B Nickel plated steel parts shall withstand 16 hours in a salt spray test without appearance of rust on significant surfaces.
- CLASS C Nickel plated steel parts shall withstand 8 hours in a salt spray test without appearance of rust on significant surfaces.
- DRAWINGS The significant surfaces shall be indicated on all parts drawings, together with the desired specification class.

(Description of "Sampling" and "Salt Spray Test" omitted.)

JANUARY, 1926.

Figure 14

on automobiles, it might be well to take this up first.

Salt spray testing on nickel plated steel parts has been previously mentioned in this article as the evaluating test first used to determine the quality of plating on parts and is still used as a porosity test.

In the early days, salt spray was for the most part, the only test applied in the acceptance or rejection in the plating on various parts. The Studebaker specifica-

tion was issued in 1923 and called for a salt spray test of fifteen hours. Chrysler specifications were in effect from 1921 to 1929. This test called for sixteen hours. General Motors specifications of 1926 called for twenty-four hours. The difference of salt spray hours in these specifications may or may not have any significance.

The interpretation of salt spray testing depends on a number of things, one of which is the eyesight of the inspector, and his disposition. His disposition might be affected by a number of factors such as a bad cold, a night out, trouble at home, his nature, or how badly does the production line need the parts. A lot has been done to clarify the application of salt spray testing. Countless hours and words have been used to make the tests uniform and accurate, but it is by comparison more of a two-foot rule than a micrometer.

Now let us refer to the Chrysler specification which is as good an example of the requirements of the whole industry as I have been able to find. The industry worked co-operatively through A.E.S., the A.S.T.M. and the Electrochemical Society to advance the art of plating. The Bureau of Standards should also be mentioned as a great factor in the improvement which took place. Looking at the Chrysler specifications, the following observations seem pertinent. Until 1929, salt spray was relied upon almost entirely. In 1929, thick-

GENERAL MOTORS STANDARDS

PLATING SPECIFICATIONS

G.M. Number	BASE METAL AND TYPE OF PLATING	CODE	CLASS See Note 9	MINIMUM THICKNESS, IN INCHES, ON SIGNIFICANT SURFACES ⁽⁸⁾				SALT SPRAY Hours ⁽⁵⁾ 95°F. ± 5°F.	
				Total	Copper	(1)		Complete Resistance	Minor (6) Pin Holes
						Nickel	Chromium		
4251-M	<u>STEEL</u> Copper, Nickel & CHROMIUM	300	AAAA	0.003	See Note (3)	0.0007 ⁽²⁾	0.00001	144	216
		200	AAA	0.002	See Note (3)	0.0006 ⁽²⁾	0.00001	96	144
		150	AA	0.0015	May be used, but not required	0.0005	0.00001	-	48
		100	A	0.001		0.0004	0.00001	-	32
		75	AB	0.00075		0.0002	0.00001	-	24
		50	B	0.0005		0.0002	0.00001	-	16
	<u>BRASS OR COPPER</u> Nickel & CHROMIUM	30	AA	0.0003		0.0003	0.00001	-	-
		20	A	0.0002		0.0002	0.00001	-	-
	<u>ZINC BASE DIE CASTINGS</u> Copper, Nickel & CHROMIUM	150	AA	0.0015	0.0005	0.0005	0.00001	-	48
		100	A	0.001	0.0003	0.0003	0.00001	-	32
		75	AB	0.00075	0.0002	0.0002	0.00001	-	24
	<u>ZINC BASE DIE CASTINGS</u> Nickel & CHROMIUM	20	C	0.0002	See Note (4)	0.0002	0.00001	-	4
4255-M	<u>STAINLESS CHROMIUM</u>	1	A	-	-	-	0.00001	-	-
4254-M	<u>ALL BASE METALS</u> NICKEL	Same classes as G.M. 4251-M apply in all particulars, but with chromium plate omitted.							
4250-M	<u>STEEL</u> Strike Plated Copper	0 (11)							
4252-M	<u>STEEL</u> ZINC or CADMIUM	50	A	0.0005				-	48 ⁽⁷⁾
		20	AB	0.0002				-	32 ⁽⁷⁾
		15	B	0.00015				-	24 ⁽⁷⁾
		10	C	0.0001				-	-
		0 (10)							
	<u>BRASS OR COPPER</u> ZINC or CADMIUM	0 (10)							
4253-M	<u>STEEL</u> TIE	20	A	0.0002				-	24

Figure 15.

CHRONOLOGICAL DEVELOPMENT OF NICKEL AND CHROMIUM PLATING OVER ZINC ALLOY BASE DIE CASTINGS

Year	Interior Parts					Exterior Parts				
	Thickness of Plating, Min. Inches					Thickness of Plating, Min. Inches				
	Copper	Nickel	Total Copper Plus Nickel	Chromium	Salt Spray Test Hours	Copper	Nickel	Total Copper Plus Nickel	Chromium	Salt Spray Test Hours
1927 - 1928		.0002		.000016	(1)		.0002		.000016	(1)
1928 - 1929		(2)		(3)	8 (4)		(2)		(3)	8 (4)
1929 - 1930		.00013		.00002	8 (4)		.00013		.00002	8 (4)
1930 - 1932		.00024		.00001	8 (4)		.00024		.00001	8 (4)
1932 - 1935	None .0005	.00024 .00024	.0	.00001 .00001	8 8	None .0005	.0003 .0003		.00001 .00001	12 12
1935 - 1936	None .0003	.00024 .00024		.00001 .00001	8 8	None .0003	.0003 .0003	.0008	.00001 .00001	16 16
1936 - 1941	None .0002	.00024 .00024	.00044	.00001 .00001	12 12	None .0003	.0008 .0003	.0008	.00001 .00001	32 32
1941	.0006	None		.00001	12	.0003	.0002	.0008	.00001	32
1944 - 1951	None .0002	.00024 .00024	.00044	.00001 .00001	12 12	None .0003	.0003 .0003	.0008	.00001 .00001	32 32
1951 - 1952 (6) (7)	.0002 .0002	.00024 None	.00044	.00001	12 12	.0003 .0005	.0003 None	.00008	.00001(8)	32 48
1952 - Date	.0002	.00005		.00001	12	.0005	.00005		.00001(9)	48

NOTES:

- (1) Must resist tarnishing when exposed to ferroxy, salt spray or weathering tests.
- (2) May be chromium plated directly over basis metal or with an intermediate copper or nickel plate.
- (3) 4-5 minutes at high current density.
- (4) 30 day atmospheric weathering also specified.
- (5) If copper used under nickel, minimum thickness must be as specified.
- (6) Parts on which nickel plating is permitted.
- (7) Parts on which nickel plating is restricted.
- (8) .00075" minimum thickness of clear enamel required over chromium.
- (9) .0005" minimum thickness of clear lacquer required over chromium.
- (10) Antimony black dip specified as secondary test since 1930.

ness of nickel is mentioned as a minimum of 0.00027". In 1930, the total thickness of plate was required to be 0.00072", and the salt spray was kicked up to twenty-four hours. From 1931-1936, the total thickness of plated metal was required to be 0.001". Copper was permitted to make up a portion of total plate thickness, but was not required.

From 1936 to the present, the total plate is still 0.001", but the Chrysler specification was somewhat at variance with some of the rest of the industry in that they favored the use of nickel instead of copper-nickel. It should also be noted in the Chrysler specification, as in others, that parts receiving more severe outside exposure required greater thickness. It is also to be noted that from 1927 on, chromium plate was used over the copper and nickel plate or over the nickel plate only and was specified by most companies at 0.00001". This fact is demonstrated by the General Motors specification which you will see below and thoroughly demonstrates the practice of the industry. You will note that there are a number of Codes or thicknesses required in the General Motors specifications, depending on the severity of the exposure to which the parts were subjected in use.

I might point out that for the period of the Korean conflict there were many parts, which I have previously

mentioned, that were not plated with nickel but had to rely on copper plus chromium and a coat of clear enamel. The industry is not proud of the finish on these parts except to the extent that, as the undertaker said, he did the best he could with what he had to work with. The following specification is a good example of this type of plating:

Emergency War Specification

Base Metal	Code	Exposure	Copper Thickness Inch, Min.	Chromium Thickness Inch, Min.	Enamel Thickness Inch, Min.
Zinc Base Die	30	Interior	0.0003	0.000010	0.0004
Castings	50	Exterior	0.0005	0.000010	0.001
Steel	30	Interior	0.0003	0.000010	0.0004
	50	Exterior	0.0005	0.000010	0.001
	80	Exterior*	0.0008	0.000010	0.001

*Code 80 finish on steel is intended for use on vulnerable parts exposed to action of gravel, etc.

The second most important plated surface, insofar as volume is concerned, is the surface of zinc base die castings. By referring to the Chrysler specification the same tendency in increasing the thickness of plate can be observed as the years went by. It might also be noted that the thickness of the chromium is the same as was used on steel parts, as it is on all parts, no matter what they are made of.

(Concluded on page 85)

Surface Treatment and Finishing of Light Metals

Part IV. Chemical Cleaning and Pre-Treatment Processes

By S. Wernick, Ph.D., M.Sc., F.R.I.C., F.I.M., and R. Pinner, B.Sc.

The first half of Part IV of Dr. Wernick's article appeared in the August issue.—Ed.

Etching for Designs

ACID ETCHING:

Designs, letters, graduations, etc., may be obtained on aluminum surfaces by etching in acid solutions. Etched designs of this kind may then be filled in with pigmented lacquer or enamel or they may be electroplated or color-anodized.

The first step in design etching is to clean the surface thoroughly to ensure adhesion of the stop-off and promote uniformity of attack. For this purpose the work is degreased and given a hot alkali cleaning.

After cleaning, the required portions are stopped-off from a master plate or roll and the material is fired or baked in to improve its protective value and to permit the article to be handled more easily. In applying the stop-off, the design is printed on the metal surface with etching ink. While the ink is still tacky, the surface is dust printed with finely divided asphaltum, beeswax and resin, and the loose non-adherent powder is removed from uninked areas by a low-pressure air-blast or by dusting with talcum powder. The asphaltum should then be fused by heating the work to about 400°F.

Two solutions may be used for the actual etching process. The work may be dipped into an aqueous solution of hydrochloric acid. In this solution, streaks are produced unless the surface is uniformly clean. They may be avoided, however, by a preliminary dip in nitric-hydrofluoric acid solution. A somewhat smoother etch is obtainable by solutions of hydrochloric acid saturated with sodium chloride. This process may be accelerated by addition of a small quantity of nickel or cobalt chloride. A coating of metallic tin may be obtained, on the other hand, by dipping the work in an aqueous solution of stannous chloride prior to etching.

If a deeply etched surface is required, the work should be periodically removed from the bath and the sides of the engraving blocked up with a suitable resist in order to prevent undercutting of the metal. The solution should preferably be agitated to prevent local attack which would result in non-uniformity of depth of etching.

ALKALI ETCHING:

An alternative method of obtaining engraved or etched finishes is by etching the metal in dilute caustic soda solution or in uninhibited alkaline cleaning solu-

tion. Prior to etching, heavy contamination should be removed from the work by vapor degreasing or emulsion cleaning. The work is then immersed in a 1 to 2 oz./gal. caustic soda solution for sufficient time to achieve the desired appearance, and then rinsed quickly to avoid staining. From the rinse, the work is then transferred to the whitening dip which may be nitric acid or, in the case of high-silicon-containing alloys, a nitric-hydrofluoric acid mixture. A brighter and more uniform etch may be obtained if sodium fluoride is added to the caustic soda etching solution. As in the former process, the work is rinsed, given a nitric acid dip, rinsed and dried. Surfaces varying from lightly etched to frosted finishes with the appearance of finely etched glass may be obtained by this method, depending on the period of immersion and the alloy composition. Though caustic soda etches have the advantage of being simple and cheap, they are somewhat difficult to control and have been largely replaced by acid treatments, slightly inhibited or uninhibited alkali solutions being mainly used for stripping of organic and oxide coatings.

Alkali Cleaning

Of all cleaning processes, this is the most important. As distinct from most other metals, aluminum is amphoteric and is readily attacked by alkali solutions. Alkali cleaners for use with aluminum and its alloys must work, therefore, at comparatively low alkalinity, and are "inhibited" in order to form a protective film over the surface, which will prevent attack of the metal during cleaning. The modern alkali cleaner needs to be strictly controlled, and the ideal cleaner should satisfy the following conditions:

(1) The salts should be completely and easily soluble and the cleaner should be stable and possess good rinsing properties.

(2) Its alkalinity should be suited to the metal, i.e., for aluminum preferably between pH 9 and pH 11. It should also be buffered to help maintain constant activity of the cleaner.

(3) It should possess good wetting power.

(4) It should have a high emulsifying power to break up and disperse such oils and greases which can form soluble soaps.

(5) It should be able to deflocculate dirt particles and disperse them throughout the solution by colloidal action.

(6) The cleaner should be inhibited to minimize attack on the base metal.

(7) It must be non-irritant to the skin, and should preferably be non-toxic.

(8) The cleaner should act as a water softener and so prevent precipitation of hard-water salts on the metal surface.

(9) Last, but not least, the cleaner must be economical.

Cleaner Inhibitors

The function of inhibitors in alkali cleaning is to provide a protective film which is formed by reaction of the inhibitor with the aluminum or the oxide surface, or, in the case of silicates, a molecular layer of hydrated silica may be formed superficially. Compounds commonly employed for the purpose may include silicates, chromates, phosphates, fluorides, silicofluorides or organic materials. Care must be taken, however, not to inhibit the cleaner too strongly by forming too tenacious a film, the aim being a minimum of visible etching, at the same time allowing a mild chemical attack which speeds up the cleaning cycle. When the protective film is slight, gassing occurs at the solution interface which, after a period, diminishes and stops. This is the induction period during which some microscopic etching takes place.

Providing the protective film is slightly soluble and thin, the cleaner exerts its emulsifying, deflocculating and peptization functions on the grease and oil. Silicates are the most widely used inhibitors and both orthosilicates and metasilicates are used. In the use of these compounds, care must be taken to formulate cleaners to make them freely rinsable. Some inhibitors, such as fluosilicates, are insoluble in alkaline solution but are soluble either in water of pH 6.5 to 7.0, or in subsequent acid baths. In acid, fluosilicate yields the corresponding acid in situ and acts as an oxide remover.

Where silicates are used, the concentration of carbonates must be kept at a minimum. Carbonates promote decomposition of silicates and produce a heavy floc which redeposits on the work. Some alloys have longer induction periods than others, depending on their composition though all are subjected to a preliminary microscopic etch during film formation, while some, due to diffusion during heat treatment, are in an insoluble condition resulting in a prolonged induction period and visible etching. Usually, however, no trouble is encountered unless corrosion salts are noticeable on the surface. Excessive induction periods may also occur as a result of corrosion spots, formed by chemical action, moist air or faulty storage, and such areas may etch during the whole period of the alkali treatment. Such corroded areas should be cleaned prior to alkali treatment in an acid dip as already indicated.

Wetting, Emulsification, Deflocculation, Saponification

It is important that the cleaning solution shall wet the surface uniformly and immediately in order to produce a uniformly finished surface. Alkalis by themselves are poor wetting agents and water, with a surface tension of 73 dynes/cm. does not readily wet oils,

which have relatively low surface tension. By the addition of wetting agents, the surface tension of the solution is reduced to a similar value to that of the contaminant. The wetting of the contaminant and, equally important, of the metal surface is, therefore, of primary importance in alkali cleaning. In the presence of wetting agents, surface oils are removed quickly and an increased penetration of the cleaner is obtained, enabling it to clean out pores. They also have an emulsifying action, preventing the redeposition of oil and keeping it suspended for long periods of time. Surface activity aids rinsing, also the prevention of hard dried-on layers or films which may develop between cleaning and rinsing. The wetting power of some of the alkalis used in cleaning is given in Table I.

The use of soaps as wetting agents should be avoided as they form insoluble metal soaps. Numerous wetting agents are obtainable and a full list, including also detergents, emulsifying and rinsing agents may be found in the literature.^{16,17}

Among the major functions of the cleaner is its power to emulsify liquid and deflocculate solid contamination and prevent redeposition on the surface. These properties are controlled by the interfacial tension between the solution and the soil and are thus directly dependent on the wetting power of the solution.

Where water-soluble alkali cleaners easily remove dirt, the alkali must neutralize acid and maintain the emulsion. Fatty oils and waxes may be saponified, the soap formed acting as a wetting and emulsifying agent. The bath may thus actually improve with age until saturation is reached. This mechanism has been exploited in cleaners not containing wetting agents, the practice being to add a bucketful of old cleaner when a new bath is made up. It is also exploited in some more recent cleaning processes.¹³ Completely soluble alkalis have little direct mechanical action in dirt removal, the actual cleaning resulting from the mechanism described.

To obtain the maximum effect of convection currents, the heat should not be applied directly underneath the tank, but at the side in order to produce a rolling action upwards and backwards throughout the tank. This will also remove surface oils and scum towards the rear of the tank and avoid redeposition. The effect of temperature on the efficiency of an alkali cleaner is very marked, and has been stated¹⁸ to be increased by as much as approximately 100 per cent for each 20°F. rise in temperature above 120°F.; agitation of the solution is also useful and enables lower concentrations of the cleaner to be used. Agitation may either be by air or steam jets and helps to keep grease in an emulsified condition; it will also help to prevent redeposition of loose oil on the metal surface. In laying airlines for air agitation, they should be fitted lengthwise along each side, resting six inches above the bottom of the tank. The lines should be perforated at an upwards and inwards angle so that emergent air streams from the two sides would, if projected, meet along the centre line of the surface.¹⁹

For use with hard water, calcium and magnesium sequestering agents are sometimes added to the cleaner in order to prevent precipitation of hard-water salts on

Table I
Properties of Cleaning Materials²⁰

Material	Concentration (in per cent)	Wetting power (w) *	Rinsing factor (R) †	Number of Bubbles‡ For	
				0.228 ml.	1.193 ml.
Soap, sodium oleate	5	215.2	—	—	—
" "	1	55.00	—	—	—
Sodium metasilicate	5	2.469	0.149	—§	—
" "	1	1.185	0.326	11, 12, 14	56, 64, 71
Trisodium phosphate	5	2.011	0.456	—	—
" "	1	1.428	1.157	11	56
Silicate of soda 180° Tw.	5	1.360	0.430	—	—
" "	1	1.148	1.070	11	58
Sodium carbonate	5	1.318	—	—	—
" "	1	1.157	—	12	64
Sodium hydroxide	5	1.217	0.048	—	—
" "	1	1.137	0.104	11	58
"Calgon"	1	1.130	—	—	—
Tap water	1	1.085	—	3	19
Pure water	1	1.000	—	—	—

$$^*w = \frac{-96.80}{S (\cos\theta_2 - 1)}$$

where S = surface tension of soln. in dynes per cm.
 θa = the constant angle against paraffin wax when advancing into solution.

$$^\dagger R = \frac{\text{roor}}{[\text{Na}_2\text{O}]d}$$

where $[\text{Na}_2\text{O}]$ = percentage Na_2O in alkali used.
 r = Na_2O present after first rinse.
 d = Na_2O present before first rinse.

‡ = Values obtained using a drop pipette with toluene.

§ = Various grades of sodium metasilicate have different values

the work. The sequestering materials also hold back floc formation and have a peptizing effect on dirt.

Cleaning Materials

Numerous cleaners are recommended for cleaning aluminum and its alloys, and the properties of some of them are given in Table I.

One of the most recent cleaners employs a mixture of sodium pyrophosphate and sodium metasilicate, the older combination consisting of trisodium phosphate and sodium metasilicate. The proportions are elastic and variable to suit each purpose, while the cleaners are used in concentration of 2 to 10 oz./gal.

Other typical formulas include:

- ²¹(1) Sodium carbonate 0.8-2.4 oz.
 Trisodium phosphate 0.8 oz.
 Water 1 gallon
 Temperature 176 and 203°F.
- (2) Sodium carbonate 1.6-6.4 oz.
 Sodium silicate 0.8-1.6 "
 Water 1 gallon

Another mixture, containing 3 oz./gal. sodium carbonate and 6 oz./gal. sodium bicarbonate, is recommended for removing soap-base compounds at between 100° and 110°F.

A two-minute immersion at 200°F. in a solution containing 2 oz. each of anhydrous sodium carbonate and trisodium phosphate is recommended as a preparatory treatment prior to a zinc-immersion plating process,²² while a 1 to 2 oz./gal. solution of equal parts by weight of sodium metasilicate and sodium carbonate is also useful for cleaning aluminum surfaces with a minimum of etching.

The time of immersion in cleaners depends on the composition, the degree of contamination, the operating temperature and whether or not the cleaner is agitated. It also varies largely with the age of the cleaner. The operating time will usually vary between two and five minutes. The time interval between operations must be kept at a minimum and the solution must never be allowed to dry on the work; slow-moving hoists should be avoided. If the work is heavily contaminated, an auxiliary alkali precleaner may be employed which may be made up from old solution from the main tank. No rinse is required between the two operations. To reduce drag-out and contamination of the rinse, a row of hot-water spray jets may be installed along the top edge of both sides of the tank. The sprays are controlled by a valve, and are turned on to spray each load as it is removed from the cleaner, with clean hot water. Tanks should be of steel and fitted with an overflow.

Control of Alkali Cleaner

The pH of the cleaner and its specific gravity should be measured at least once a week, and additions made accordingly. Alternatively, the alkalinity may be determined by titration against standard acid. After some time, the speed of the cleaner will decrease due to the increased oil load. When cleaning time is excessive or the cleaner is visibly contaminated, the solution is discarded and the tank cleaned out thoroughly. The rinse following the cleaner should be inspected for waterbreaks, and, if present, the work should be returned to the cleaner and a check made on its strength. Waterbreak may be due also, however, to oil or grease present in the rinse.

Chemical control of the cleaner is not frequently

undertaken except when testing different cleaners for comparative purposes. Standard methods for determining the concentration of alkalis, fatty acids, resin, soaps, silica, phosphates, sulphates, chlorides, carbonates and organic matter, etc., are available,²³ as well as indirect performance tests, e.g., for colloidal and water-softening properties, conductivity, solvent action, instability, and wetting and emulsifying power.²⁴

Table II shows some of the common faults of cleaners and their control.

Electrolytic Cleaning

Electrolytic cleaning is not frequently used in the pretreatment of aluminum and its alloys, because of the high rate of attack on the metal of this form of treatment and the effectiveness of hot alkaline soak cleaners. A few processes exist, however, which use the ordinary alkali cleaners with the passage of a low-voltage current.

The advantage of electrolytic cleaners lies in their increased conductivity and the scrubbing action of the gas produced at the electrodes. Voltages of 6 to 12, and current densities of 40 to 100 amp./sq. ft. are employed, the solution being operated either at elevated or room temperature. The tanks should be of steel or steel lined, and should not be used as electrodes, as electrolysis may cause failure of the welds in the tank, in addition to wasting current. Electrodes are either of steel or preferably nickel-plated steel, as nickel does not deposit in alkali solutions of the type normally employed. The electrode edge area is frequently increased by hanging separate electrodes or perforating them.

The electrolysis may be either cathodic, anodic, or alternating current may be used. Cathodic cleaning is the most common, but it has been pointed out that mechanical properties may be impaired by hydrogen embrittlement, the penetration of hydrogen into the surface increasing with increasing current density. It is sometimes found preferable to use a reversing switch

to change the direction of the current during cleaning.

Cleaning materials include those used in soak cleaning, and proprietary solutions are available. The Krome-Alume electroplating process used a d.c. electrolytic treatment in dilute sodium cyanide²⁶ while two other cleaning solutions are recommended by the U. S. Ordnance Department²⁷, containing:

(1) Sodium orthosilicate	85%
Sodium carbonate (anhydrous)	10 "
Sodium resinate	5 "
(2) Sodium carbonate (anhydrous)	46%
Trisodium phosphate	32 "
Sodium hydroxide	16 "
Rosin	6 "

Rinses

The rinsing operations in a cleaning cycle are as important as the cleaning operation and the work of the most effective cleaners may be undone by contaminated rinses. Both cold and hot water rinses are used, the latter having the advantage of keeping the pores open to permit removal of cleaning compound and entrapped emulsified oil. They are particularly valuable after alkali and acid treatments and will also speed up drying. If only one rinse tank is available, however, a cold clean rinse is more effective than a contaminated warm one and, where cleaners are easily soluble and rinsable, cold water is satisfactory provided that an efficient drying operation is added.

Rinse tanks are either of wood or steel and a small continuous influx of water at one end and an overflow trough at the other should be arranged. The aim should be to change 5 to 10 per cent of the water each minute. Running water is always preferable to still water. Hot water rinses are usually operated between 140 and 160°F. though in special cases temperatures up to boiling may be used. Agitation is desirable and this may be by steam or air. Periodically, rinse water should be tested for acidity or alkalinity with phenolphthalein. It is important that no delay be allowed

Table II
Control of Alkali Cleaners²⁵

Trouble	Cause	Remedy
Excessive corrosion in cleaner.	pH too high or loss of inhibitor.	Adjust pH; make up inhibitor.
Corrosion spots.	Alkali left on surface.	Predip in NaHSO ₄ or HNO ₃ and rinse.
Does not clean properly.	Weak or worn-out cleaner.	Make up or renew, adjust pH and wetting agent.
Does not clean properly.	Excess foreign matter on work.	Degrease in vapor degreaser or solvent emulsion cleaner.
Poor paint bond.	Poor rinsing or too tenacious inhibitor film, or improper removal of oxide film. Excessive floc pick-up in cleaner.	Clean rinse tanks and increase rate of water flow. Select cleaner with easily removable inhibitors and minimum floc formation. Use solution suitable for removal of surface film.
Smut formation on work in cleaner.	On copper-containing alloys if pH is too high.	Reduce pH, avoid free caustic cleaners, use sufficient inhibitor.
Excessive floc formation.	Breakdown of Cu, Mg & Si sequestering agents, absorption of CO ₂ by cleaner to form carbonates. Excess carbonates used in original cleaner formula. Addition of acid to cleaning soln.	Select cleaner with ample reserve of sequestering agents, e.g., polyphosphates. Avoid CO ₂ from gas burners, etc., by proper vents round tank area. Use cleaner with no CO ₂ content. Avoid acid addition by supervision.
Insoluble film formation that interferes with anodizing, wetting, etc.	Too highly inhibited. Excessive transfer time between cleaner and rinse.	Select proper amount of inhibitor which is soluble. Reduce transfer time and select cleaner with wetting agent which promotes good rinsing.

between the cleaner and the rinse, as a cleaner which has dried onto the metal surface may be very difficult to remove in the rinse. Frequently cold and hot water rinses are used consecutively after which the work is dried, either by hot air or by heating to about 300°F. in an oven.

Cleaning Before and After Welding

Prior to spot welding, the surface must not only be freed from oil, grease and dirt, etc., but the oxide film must be removed, and the surface given a uniform low electrical resistance. This may be achieved either mechanically, by sand- or shot-blasting, or scratchbrushing or, more easily, by chemical means. Several solutions are available for this purpose:

(1) The work, after degreasing and alkali cleaning, is immersed in a solution containing:²⁸

Phosphoric acid	9	oz./gal.
Chromic acid	23/4	"

after which it is given a hot water rinse and dried.

(2) A sodium bisulphate solution²⁹ may be used with or without organic additions, e.g., wetting agents, oxalic acid, etc. This method is economical, and is not critical in its operating conditions. The work tends, however, to smut up in the bath, and the solution does not remove silica-containing inhibiting films, remaining from the alkali cleaner. The solution must also be operated hot and requires special tanks.

(3) Cold phosphoric acid may be used with or without organic additions. This method is lengthy, requiring about 20 minutes to achieve the lowest possible electrical resistance as well as smutting and leaving silica on the surface.

(4) Chromic acid alone or with mineral acids or acid salts is satisfactory for removing the oxide film from duralumin-type alloys but gives poor results with pure aluminum. The solutions may be used hot or cold, require lead-lined containers, and do not smut, but also leave silicon untouched on the surface, as well as a chromate film which may interfere with subsequent processing.

(5) Fluorides and fluosilicate solutions are sometimes used. Fluosilicic acid is useful for removing the oxide film from aluminum or aluminum-clad alloys, and will remove silicon films. It is difficult to control, however, due to the low concentrations (1%) in which it is used, and smuts badly. It may, however, be used cold. Large quantities of aluminum quickly deplete the acid and build up the insoluble aluminum salt. Buffering does not help, as sodium salts precipitate the insoluble sodium fluosilicate, the solution therefore having to be constantly replenished.

Hydrofluoric acid or its salts act rapidly but are not to be recommended as the time of immersion is short and extremely critical. Also, the solution smuts readily and the work requires hand scrubbing.

(6) Diluted acetic acid or vinegar is occasionally used for removing the oxide film from aluminum-clad duralumin-type alloys.

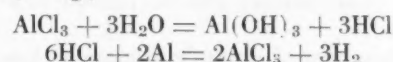
(7) Mixtures of nitric and chromic acid have also been reported to be satisfactory.³⁰

Cleaning before spot welding must be adequate in

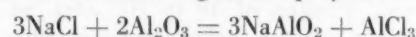
removing all traces of oxide film. In the presence of any non-uniformity, variations in welding heat will be caused by difference in the contact resistance, and the extent of the fusion will be affected.

In flame and arc welding, fluxes are employed to dissolve the oxide layers, which float on the surface of the fused metal. They also help to provide a continuous protective layer over the melt, and prevent or minimize oxidation, dissolving any oxide that may form, and preventing oxide inclusions in the weld. After welding, the fluxes must be removed as the same factors on which their efficiency depends will cause trouble later on.

Fluxes are mainly alkali chlorides which are corrosive to aluminum. Their removal is complicated by the fact that basic salts are formed with the aluminum which are hydrolyzed in the presence of water to acids and bases,³¹ e.g.,



In addition, the alkali metals in fluxing form aluminates, the acid radical being taken up by the aluminum.



These reaction products should be washed off as soon as possible, as they are water soluble only in the condition shown in the last formula.

A minimum quantity of flux should, therefore, be used in welding and the work cleaned immediately after the operation.

The work may also be cleaned by immersion in 5 per cent sodium hydroxide solution and/or a cold 2 to 5 per cent nitric acid dip. Alternately, articles may be cleaned with live steam and rinsed in clean water.

Washing Machines

Two main types of washing machines are in use for cleaning aluminum and other metals: viz., the rotary-drum type, and the pressure-spray type. Neither is very flexible in use and they cannot be relied upon to clean a variety of different articles.

ROTARY-DRUM MACHINES:

These consist of a rotating drum fitted with spiral partitions which advance the part through the machine by rotation. The drum may include scoops to throw solution over the work on the inside of the drum or may be so constructed that the drum itself dips into the solution. Various combinations are, however, possible to suit different work and cleaning cycles. The last stage in the cycle is a drying unit.

PRESSURE-SPRAY MACHINES:

These are mainly used in intermediate operations between processing and are less frequently used as a pretreatment for finishes. A stream of solution is forced against the work from various carefully chosen angles with a pressure of 90 to 100 lb./sq. in. The work is moved through the spray on a conveyor and the force of the spray and its detergent properties remove oil, grease and inorganic dirt. The cleaning material must be non-foaming. These machines are valuable for dealing with recessed work as the stream will enter recesses with considerable force.

Cleaning Cycles

With the large variety of alloy compositions, shapes and forms of contamination that may be encountered, it is not possible to prescribe cleaning cycles for every individual operation. Thus, cases have been reported in which aluminum alloys are anodized directly after fabrication, while surface scale has been known to provide an adequate paint base.

The care taken in the supervision of pretreatments will be amply repaid by the economy gained in the finishing processes, low rejection figures and the permanence and appearance of the finished article.

A general purpose scheme for cleaning is scheduled below, but it should be emphasized that this represents only a foundation for designing cleaning cycles for individual requirements.

Vapor Degreaser, Solvent Emulsion Cleaner
or Hand Cleaning.

Rinse

Acid Etch. Inhibited Alkaline Caustic Dip.
Cleaner.

Electrolytic Cleaner. Rinse. Acid Dip.

Mixed Acid Dip.

Acid Dip. Rinse. Rinse.
Caustic Dip.

Rinse.

Finishing Processes
Welding, etc.

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PLATING IN THE AUTOMOTIVE INDUSTRY: ITS HISTORY AND DEVELOPMENT

(Concluded from page 79)

The chief function of the chromium is to prevent the tarnishing of the rest of the protective plating. I think the whole industry started out with about 0.000020" of chromium but for reasons previously explained, found that 0.000010" gave better results which is about the only case I know of where a thinner plate is better than a thicker one.

Other plating done largely to protect parts from corrosion is zinc and cadmium. You will find a fairly representative outline of specifications for this type of plating in the General Motors specification.

The use of gold plating on parts has come into the industry in rather a limited way in the past few years. It is freely admitted that a thick deposit of gold would give the best results. However, much of the industry relies on a fairly thin coating plus an overlayer of

baked synthetic enamel. Experts have found that gold plating of sufficient thickness without any clear enamel gives very good results. It tarnishes only very slightly under very severe conditions and this tarnish is easily removed by wiping.

The platinum group metals have been proposed for use in the automotive industry but the color of the platinum group metals is so nearly that of chromium, and the cost is so high by comparison with chromium that its use has not become at all common.

The color of all the metallic elements, with the exception of gold and copper, is white at least to some degree. It is possible, of course, for an expert to tell the difference between some of these white metals when deposited on plated surfaces and buffed. However, the writer tried this on a group of prominent engineers and most of them did not do too well in picking out which metal was which. The styling sections have been asking for chromium plate with color, preferably that of gold, so as to get some new effects. So far I have not heard of anyone producing such a plate.

Shop Problems

Abrasive Methods—Surface Treatments—Control
Electroplating—Cleaning—Pickling—Testing

METAL FINISHING publishes, each month, a portion of the inquiries answered as a service to subscribers. If any reader disagrees with the answers or knows of better or more information on the problem discussed, the information will be gratefully received and the sender's name will be kept confidential, if desired.

Buffing Gold Deposits

Question: What type of buff should we use and at what speed to color gold deposits 0.00005" thick?

E. T. C.

Answer: A gold flash deposit is not generally buffed because of the probability of cutting through the deposit to the basis metal. However, if necessary, a flannel or domet cloth buff should be employed at a speed of about 3,000 lineal feet per minute.

Bright Brass Finish on Steel

Question: We understand there is a bright brass plating on steel being produced either by electroplating or by plating and using a bright dip. Can you advise us as to the method being used to accomplish the above finish?

R. J. S.

Answer: Brighteners are added to brass plating solutions but the finish is not equivalent to that produced by bright nickel and requires buffing. Brass deposits, if heavy enough, can also be bright dipped.

The most effective method of producing a full bright finish on steel without buffing is to apply a bright nickel deposit to the steel, followed by a flash in the standard brass solution for color. The finish must, of course, be lacquered for protection.

Heat Scale on Stainless Steel

Question: We have some drink mixer cups we are having trouble with. They are made of stainless steel and have a heat stain on them from forming in a punch press. We have tried several acid formulas without success. We are now trying to brighten them with steel wool mechanically,

without success as far as production is concerned.

Could you give us any information in regards to this problem? These cups are polished and buffed on the outside.

J. R.

Answer: The fact that the heat stain is not removed by acid pickling would indicate that the metal has not been annealed properly. Our only suggestion in this case would be to try electropolishing on the inside using an auxiliary cathode.

Patina on Lead

Question: One of our customers has a problem as to how to procure a patina finish on lead products made of 94% lead with 6% antimony. This is a sort of oxidized finish. Any help would be appreciated.

G. V. M.

Answer: The Lead Industries Association suggests the following formula for producing a patina on lead:

Cupric nitrate	8 oz.
Ammonium chloride	4 "
Acetic acid	4 "
Chromic acid	1 "
Water	1 gal.

This solution is painted on the surface or the articles are dipped into it. The chemicals are allowed to dry on the surface without rinsing.

Spot-Free Drying

Question: We produce bright brass plated hardware. The base product is zinc die castings. After the final hot water rinse, the parts are removed from the racks and dried in sawdust. In the mixing and agitation in sawdust, the parts tend to scratch each other. Is there any other way of final

drying without tarnishing or leaving any residue on the parts, for example, by dipping the racks and parts into a solution and removing them absolutely dry? A lacquering operation follows.

S. B.

Answer: There are three common methods of producing a dry, spot-free surface. These are as follows:

1. Use deionized water as a final rinse and oven dry at a temperature below 225 deg. F.
2. After the final rinse, dip in "precipitating" thinner and allow to dry in air or oven. The thinner displaces the water which settles to the bottom of the container and is removed regularly.
3. After the final rinse, dip in water-displacing solvent, the action of which is similar to that of the thinner above, but which leaves a film of a hydrocarbon oil on the surface. The oil film is then removed in a vapor degreaser, leaving the work bone dry.

Hard Silver Plate

Question: We have been receiving one or two complaints regarding the softness of our plate and would be glad to have your information. We plate our spoons and forks to the following deposits:

Dinner size spoons and forks	30 dwts. per dozen
Dessert size spoons and forks	20 dwts. per dozen
Tea and coffee spoons	12/15 dwts. per dozen, depending on size

We use a Turkey Red solution and a current density of approximately 6 amps per square foot. Could you please let us know whether there should be any noticeable difference in the hardness of the silver plate coming from various factories? Have there been any technical developments which ensure that the plate produced is less easily scratched and rubbed?

L. R. C.

Answer: The amount of silver you are applying to your flatware compares

very favorably with the best plated ware produced in this country and there would be practically no difference in hardness between the deposits from different manufacturers, except that brighteners result in a deposit which is quite a bit harder than those from dull silver baths.

We know of no technical developments which will ensure a deposit which is less easily scratched and rubbed.

Shielding Anodes and Cathodes

Question: I am a rank amateur and read your article under "Shop Problems," page 79, March 1954 issue, entitled "Hard Chromium Plating." In your answer you refer to positioning anodes, "It is being done every day, but exact amount by which an anode should be shorter than the part being plated or how much of the top of the anode should be shielded. . ." Would shielding accomplish same results as shortening the anode? Can you supply the name of a good text on the subject of shielding anodes?

J. F. W.

Answers: Shielding would accomplish the same results as shortening the anode. Either the anode or the work can be shielded and the amount determined by trial and error.

We know of no text on the subject of shielding anodes. Articles published in the past on the subject of throwing power and metal distribution in plating solutions would be applicable but practically all of these articles are quite involved technically.

Polish Finish on Powdered Metal Parts

Question: To date we have been completely stymied in our efforts to produce a satisfactory chrome plated surface finish on brass sintered powdered metal parts. It is necessary that we obtain a highly polished surface finish, which is known in our manufacturing terminology as a "hardware finish." We have had no difficulty at all in plating the parts through a copper-nickel-chrome cycle, but have been unable to eliminate the tiny surface pits caused by the porosity in the powdered metal parts.

M. C. B.

Answer: The only method of which we are aware for removing the tiny pits on powdered metal compacts is to apply a heavy, soft, copper deposit and then buff to flow over the pit marks.

Cadmium Plate on Silver Solder

Question: In our process we silver braze a cold rolled steel tube which we cadmium plate .0005 thick and bright dip. The cadmium plate looks good immediately after plating but upon standing several days the area where the silver solder is starts to turn dark and progresses gradually.

I would like to know what the reason for this is and what measure I can take to remedy this as soon as possible.

W. K.

Answer: Our first guess as to the cause of the darkening of the cadmium at the silver soldered joints would be pores in the joints entrapping solution, which later oozes out to attack the

deposit. If this is the case, which can be confirmed by examination under magnification, we would suggest baking the parts after plating.

Silver Recovery from Acid Strip

Question: We strip a considerable amount of silver plate off hollowware, trays, etc., using a silver strip consisting of 19 parts sulphuric and one part nitric acid. We would like to be advised as to how we can reclaim the silver from this silver strip.

C. R. B.

Answer: The silver can be reclaimed by dilution with water, followed by addition of a solution of sodium chloride. The collected silver chloride mud is washed free of acid and can then be sent to a refiner.

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ABSTRACTS

Electropolishing of Carbon Steels

Gép: (Machining). Vol. 3, pp. 420-424 also *Zbl. Ung Techn.* (Budapest). Vol. 4, pp. 94-95.

The application of electropolishing can cause still visible craters which are present on the surface of the mechanically buffed surface, to disappear. As a result of the anodic process whose intensity is exerted more strongly on the prominent parts of the surface than in the hollows, the surface irregularities are smoothed out and disappear and the surface becomes mirror bright. However, many difficulties are still encountered and have to be overcome with electropolishing techniques as solution with materials of this nature only proceeds smoothly if the material consists of similar shaped and sized crystals as, for example, is the case with high purity aluminum or with austenitic stainless steel. With carbon steels it was found possible to obtain a smooth electropolish only during the course of the present research. As with all electropolishing processes, during the metal removal stage it is necessary to induce by the formation of a thick, strongly concentrated solution coating a "passivation" condition. The following factors must be observed with the choice of an electropolishing solution for carbon steels. It should either possess a high resistance as, for example, perchloric acid which renders possible cold operation between 50 and 200 volts or should only have a low resistance by which a 4 to 23 volt warm process can be applied. For electropolishing carbon steels it was found that the best results were obtained with a mixture of sulfuric and phosphoric acids with the bath operated at 40° to 50°C. The most favorable working conditions were found when a lead cathode was used. The current density should be 80 to 100 amp./sq. dm. at 12 volts.

Surface Protection by Evaporation Deposition of Rare Metals

Metall. Vol. 7, p. 120.

Many metal compounds such as chlorides, fluorides, bromides, iodides as well as carbonyls are vaporizable

when heated. At 800 to 1,800°C. decomposition takes place by which the metal is deposited in the free condition and, when this process is conducted with the use of suitable equipment, the metal vapor can be precipitated as a film on the surface to be protected. Thus, for example, high melting point metals which do not show sufficient oxidation and corrosion resistance can be upgraded by means of such an evaporation-precipitation process and made suitable for certain purposes. The volatile halogen compounds of the following metals have been found to be suitable in the presence of oxygen-free protective gases or in a high vacuum for metallizing purposes: uranium, titanium, molybdenum, thorium, zirconium, tungsten, vanadium.

In the presence of oxygen, a diffusion of the following metals into a base metal surface capable of reaction can also be obtained from the halogen compounds: tantalum, molybdenum, boron, niobium, tungsten, and silicon. From the vaporized carbonyls of molybdenum, chromium and tungsten, cementation of these metals into a receptive steel surface can be achieved. The metals of the platinum group also allow of evaporation-deposition by the thermal decomposition of their carbonyls or halogen compounds. Practically all the metals are today also volatilizable directly in high vacuum by cathodic sputtering.

Diffusion Processes with Electroplated Chromizing of Steel

E. Raub: *Mitt. Forschung Ges. Blechverarbeitung*. Vol. 2, pp. 13-17.

The author conducted researches on the diffusion of electroplated chromium and copper into the surface of the steel on which the coatings were deposited and one of the objects of the test was to determine the influence of the heating duration (up to 10 hours), the temperature (950° to 1,200°C.) and heating in nitrogen, hydrogen or in a vacuum as well as an addition of chlorides (ammonium or zinc chloride) on the thickness of the diffusion coating and on the diffusion velocity.

Hard Chrome Plating

Maschine und Werkzeug. Vol. 53, No. 14/15, pp. 11-12.

The steel types which are intended for hard chrome plating must be carefully heat treated and the prescribed



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hardening procedure must be precisely adhered to and internal stress must be removed by suitable stress relieving heat treatment. The thickness of the plated hard chromium coatings applied vary in general between 0.02 and 0.5 mm. according to the purpose of application. The hardness, denseness, smoothness, porosity, brittleness, adhesion, color and reflectivity are capable of being influenced within a certain range by the working conditions, the pre- and post-treatment applied, further by the chromium solution composition, the bath temperature and the current density.

The wear resistance and stability of the hard chrome coating to high temperatures as well as the protection from corroding effect of combustion products of the fuel have, among other things, led to a satisfactory and extensive application of hard chrome coatings for the internal wall coating of cylinders of internal combustion engines.

Diffusion Techniques with Chrome Plated Steel

E. Raub: *Mitt. Forschungsgesellschaft Blechbearbeitung*. No. 2, p. 13.

The technical application of the diffusion of electroplated chromium coatings on steel has potentialities, according to the author, for the conversion of thin, non-corrosion resistant chromium coatings to thicker, pore-free, corrosion-resistant chromium-iron alloy coatings, which in addition to providing corrosion protection also possess a decorative appearance. The practical application is limited by the high temperature of the chromium diffusion.

Bright Anodizing of Aluminum

W. Helling and H. Neunzig: *Aluminium*. Vol. 28, pp. 289-295.

The authors discuss the anodic oxidation of aluminum after a prior chemical or electrochemical smoothing of the metal surface which, in its end effect, results in bright anodizing. The details of many anodizing processes are considered. Current-voltage curves show the characteristic phenomena of the surface smoothing. The smallest impurities in the metal surface can give rise to defects and, accordingly, the parts to be brightened by pickling and polishing must be mechanically processed.

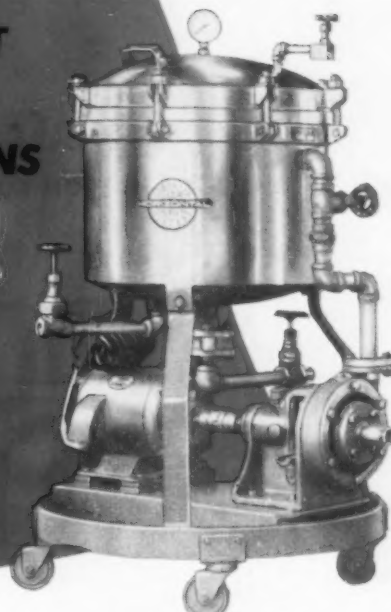
In recent years, to an increasing extent, solutions for chemical polishing have been recommended which contain mainly phosphoric acid and work between 80° and 120°C. with treatment times of between 3 and 10 minutes. The alkaline solution which has become known under the designation of Alupol I, attacks very rapidly. Other brightening processes work with a solution of ammonium bifluoride in nitric acid or with mixtures of sulfuric, phosphoric and nitric acids. The bright anodizing is strongly influenced by the co-admixtures present in the aluminum metal. It has proved itself in an outstanding manner for the most varied applications.

The Newer Protective Processes for Zinc and Tin

H. Anders: *Werkstoffe und Korrosion*. Vol. 3, No. 12, pp. 460-461.

Up to now, for the surface protection of zinc, only a relatively few processes have been suggested and, of those developed in practice, application has been of relatively limited extent. The practical difficulties which are encountered with the chemical treatment of zinc surfaces are governed by the fact that only a few relatively insoluble zinc compounds are known so that here, as is the case with magnesium, one has to turn to the deposition of foreign metal compounds by reduction. With the anodic treatment it is true that in certain electrolytes sealing coatings are formed, but it has not yet proved possible practically to produce commercially useful protective coatings in this manner. The chemical protective processes are based mainly on the use of alkaline chromates. Thus, the Mannesmann and Siemens-Halske processes employ a solution containing 200 g./l. of sodium chromate and 5-6 cc. of concentrated sulfuric acid. The coating which consists mainly of basic zinc chromates is a greenish yellow to brown film. The Metallgesellschaft process uses a two stage process; the first solution contains 25% chromate, 10% hydrochloric acid and 65% water and the zinc assumes the appearance of old brass. The second stage solution contains 10 to 70% chromate, in which the surface color disappears. The apparently passivated bright metal surface produced in this way is stable in air. Colorless protective coatings on zinc are also formed by a solution of

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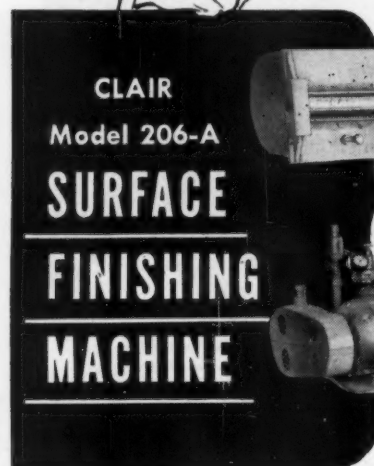
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60 g./l. of a mixture of sodium carbonate and potassium chromate in the ratio of 5:1.5.

Anodic treatment processes for zinc surfaces are intended to induce a strengthening of the very thin protective coatings formed by the chemical processes, as with light metal oxidation. A typical method is to treat the zinc parts as the anode in a solution with a pH value of 6-8. The anodizing baths usually contain chromates, with the addition of various other salts such as ferro- or ferricyanides, permanganates or oxalates. Both temperatures are around 50°C. and current densities are 0.05 to 2.6 amp./sq. dm. Research conducted by K. Voss showed that the zinc anodizing baths arranged

to operate with dichromate solutions produced the best protective coatings, while the anodic oxidation of zinc in dilute alkalies as for example 2% sodium hydroxide solution at 5 volts and 15 amp./sq. dm. produced not very corrosion resistant coatings which, however, could be of value for decorative applications on account of their green to black colorations.

Regarding the surface protection of tin coatings it has been found that the surface resistance against sulfide attack, as from food products, can be raised to a considerable extent by anodic oxidation in dilute ammonia solutions or in other weak alkaline solutions. A further anodic oxidation process developed by the Swiss Oerli-

kon company comprises a procedure for the production of electrical insulating coatings on tinned copper conductors by treating anodically in a solution of acid phosphate, of chlorides or nitrates and an ammonia salt as well as oxidizing agents, such as sodium chlorate. The anodic black coloration of tin and tin alloys is conducted in solution of 3 and 4 valent anions such as phosphates and ferricyanides. With sufficiently high current densities, there are formed dense coherent films on the metal surface. The film thickness is about 1.7 to 2.5 microns.

Electropolishing of Metals — Particularly Aluminum

H. C. Stromenger: *Chemische Rund.*
Vol. 6, No. 1/2.

Metal polishing procedures can be classified as mechanical polishing, chemical brightening and electrochemical or anodic polishing. Some baths have been developed which are suitable for oxidizing the metal surface with hydrogen generation without current and which also are able to dissolve the oxide. With careful operation of the brightening bath, surfaces are obtained which are indeed mirror bright and have a reflectivity approximately 85% of that of a silver mirror. The Jacquet perchloric acid-acetic anhydride electropolishing baths have proved particularly valuable. As a general guidance rule, it can be accepted that acid electrolytes are used for basic metals and alkaline electrolytes for acid metals respectively. Both types of electropolishing baths, acid or alkaline can be used for the amphoteric metals and cyanide solutions for metal complexes. Formulas for the calculation of the current strengths and details of the phenomena occurring at the anode and in the anode chamber with the electrical phenomena are provided and operational curves for various electropolishing baths are considered.

The Triangular Cell — New Instrument for Plating Bath Control

E. Bertorelle: *Galvanotecnica*. Vol. 4, p. 169.

The triangular cell has proved to be an exceptionally useful instrument for the examination of deposits from plating baths. The author discusses re-

search which was conducted with the use of the triangular cell in an investigation on electroplated zinc deposits and, with its aid, more satisfactory and rapid research results were obtained. Its field of useful application extends over the most varied electroplating baths and the application of the cell is very simple; it offers advantages as compared with the Hull and Moehler cells. The electrolyte volume of the cell is 500 cc.

PATENTS

Plating Porous Metal Bearings

*U. S. Patent 2,664,326. Dec. 29, 1953.
J. F. Kuzmick, assignor to Ekstrand & Tholand, Inc.*

The method of making a porous plated bearing comprising forming a bearing body of powdered ferrous metal by molding the powder into the shape of a bearing under sufficient pressure to produce a green compact mass capable of retaining its form and which includes interconnected pores, electroplating the bearing surface of said body with a bearing metal forming a porous metallic coating, subjecting the electroplated bearing body to a heat treatment of sufficient intensity and sufficient duration to remove any salts retained in the body, and heating the bearing body sufficiently to sinter the powdered bearing body mass to provide mechanical strength for retaining the bearing in operating condition while retaining the porous structure.

A bearing made according to the process of claim 1 wherein the plated bearing comprises a body of porous ferrous metal with an electroplated bearing surface wherein the plated bearing is free of salts.

Lead Bath Addition Agent

*U. S. Patent 2,664,393. Dec. 29, 1953.
F. C. Mathers and G. B. Lantz, assignors to U. S. Smelting Refining and Mining Co.*

In the electrolytic process of depositing lead in an aqueous electrolyte containing lead fluosilicate the step which comprises the addition to the electrolyte for each ton of lead deposited of from 0.5 to 5.0 lbs. of goulac and from 0.6 to 0.06 lb. of material selected from the group consisting of water-soluble portions of aloes and electrolyte-soluble portions of aloes.

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Metal Polishing

*U. S. Patent 2,664,676. Jan. 5, 1954.
P. K. A. Cuppers, assignor to Wurttembergische Metallwarenfabrik.*

A device for finishing the surfaces of workpieces comprising a pan mounted for rotation about its center axis and having therein a finishing mass of abrasive and like materials only partly filling said pan, means for rotating said pan at a speed at least sufficient to cause the formation under action of the centrifugal force, of a mass ring in said pan, a swingable arm and a workpiece holder arranged at the free end of said arm and adapted to hold the workpiece, said arm being swingable in a plane extending substantially

radially and parallelly to the centrifugal pan axis into a position where the workpiece holder is disposed freely accessible outside of the centrifugal pan, for chucking and removing the workpiece, and into a second position where the workpiece fastened to the workpiece holder is disposed in the inner annular zone of the mass ring.

Vacuum Metallizing

*U. S. Patent 2,664,853. Jan. 5, 1954.
F. W. Schuler, assignor to National Research Corp.*

Apparatus for coating a substrate with aluminum by vacuum evaporating said aluminum on said substrate, said apparatus comprising a vacuum cham-



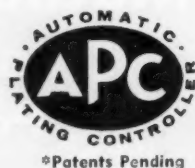
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ber, means for evacuating said chamber, means providing a source of aluminum in said vacuum chamber, means for evacuating said chamber, an elongated hollow member having an elongated groove along the top thereof position within said chamber said member having a surface wettable by molten aluminum, means for feeding aluminum from said source thereof to said hollow member at a rate sufficient to keep said groove substantially completely filled with molten aluminum, said wettable surface on said member assuring coverage by molten aluminum of a substantial portion of said member in addition to said groove, a heater rod inside of said hollow member, means for electrically insulating said heater rod from said hollow

member, means for supplying electric current to said heater rod to raise the temperature thereof to about 2,000°C. and above, and means for passing said substrate over said member to coat said substrate with aluminum.

Vacuum Metallizing

*U. S. Patent 2,664,852. Jan. 5, 1954.
E. E. Chadsey, Jr., assignor to National Research Corp.*

Apparatus for coating a heat-sensitive substrate with aluminum by vacuum-evaporation of said aluminum and condensation of said aluminum upon said substrate, said apparatus comprising means defining a vacuum-tight chamber, a container mounted in said vacuum chamber for confining molten

aluminum, a heater surrounding said container for melting aluminum in said container and maintaining said aluminum at a temperature not much in excess of the melting point thereof, a heat-resistant carbon tube mounted vertically in said chamber for confining high-temperature molten aluminum within said vacuum chamber so that vapors from said high-temperature aluminum may be condensed on said substrate, said tube having an interior surface stratum comprising a carbide of the class consisting of the carbides of the metals titanium, zirconium, hafnium, vanadium, columbium and tantalum, a second heater for heating molten aluminum at the top of said tube to a temperature on the order of 1300° C. and above, said tube extending below the surface of the molten aluminum in said container, pneumatic means for forcing aluminum up said tube from said container to the top of said tube, a radiation shield between the upper portion of the outer surface of said tube and said substrate for preventing radiation from said tube to said substrate, and means for moving said substrate past the top of said tube.

Burnishing Apparatus

*U. S. Patent 2,664,675. Jan. 5, 1954.
F. La Monica, assignor to The United Tool & Die Co.*

A burnishing apparatus including a flexible longitudinally cross-sectionally oval-shaped barrel, means for rotating said barrel, and a plurality of pneumatic rolls applied under pressure against the exterior of the barrel and forming protrusions upon the inside thereof for compacting and deflecting the contents of the barrel.

Vacuum Metallizing

*U. S. Patent 2,665,223. Jan. 5, 1954.
P. J. Clough and E. E. Chadsey, Jr., assignors to National Research Corp.*

The process for the deposition of an aluminum film on a substrate by thermal evaporation of molten aluminum in a vacuum which comprises heating aluminum to a temperature sufficiently above its melting point to evaporate the aluminum, maintaining the molten aluminum, during evaporation, on an elemental carbon support, and maintaining at the interface between the support and the molten aluminum a layer of a carbide of a

metal taken from the class consisting of titanium, zirconium, hafnium, vanadium, columbium and tantalum so as to prevent undue attack of the elemental carbon support by the molten aluminum, said carbide layer being formed by contacting said carbon support with a material comprising said carbide-forming metal while said support is maintained at a sufficiently high temperature to form the carbide layer.

Vacuum Metallizing

*U. S. Patent 2,665,224. Jan. 5, 1954.
P. J. Clough and P. Godley 2nd, assignors to National Research Corp.*

A process for coating a heat-sensitive substrate by vacuum-evaporating aluminum and condensing aluminum vapors on the substrate, said process comprising the steps of providing a source of aluminum in a vacuum chamber, evacuating said chamber, melting said aluminum to form a pool of molten aluminum, heating said aluminum to a temperature such that the aluminum vapors leaving said source have a temperature between about 1300° C. and about 1500° C., moving said substrate past said source at a speed adjusted to give a substantially uniformly thick coating having a reflectance for visible light on the order of 90%, and limiting the radiant heating area, which is in the neighborhood of said source and which does not evaporate aluminum, to less than the effective evaporating surface area of the molten aluminum from which the aluminum vapors are derived by spreading said molten aluminum outwardly from the molten aluminum pool to cover hot areas of the source which would otherwise radiate heat to the substrate without contributing aluminum vapors.

Phosphating Process

*U. S. Patent 2,665,231. Jan. 5, 1954.
P. L. Amundsen and W. A. Osip, assignors to Parker Rust Proof Co.*

In a method for coating metal surfaces, such as iron, steel, zinc and alloys thereof, the novel step of subjecting the metal to the action of an aqueous coating solution which essentially consists of an alkali metal phosphate, and an activator comprising alkali fluorides and alkali acid fluorides, until a suitable coating is formed thereon, the concentration of the alkali fluoride and alkali acid fluoride being balanced to maintain the pH of the solution between 3.0 and 5.8, the concen-

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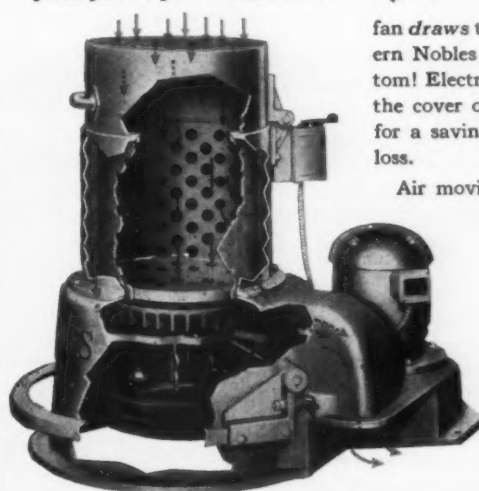
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tration of the phosphates in the solution being between 15 and 95 per cent by weight of the total chemical in solution.

Vacuum Metallizing

*U. S. Patent 2,665,225. Jan. 5, 1954.
P. Godley 2nd, assignor to National Research Corp.*

A process for coating a substrate with aluminum by vacuum-evaporating said aluminum and condensing said aluminum on said substrate, said process comprising the steps of providing a supply of said aluminum in a vacuum chamber, evacuating said chamber, melting at least a portion of said aluminum in said supply of aluminum, pro-

viding a wick element having at least a surface stratum comprising a compound selected from the class consisting of the carbides and nitrides of titanium, zirconium, hafnium, vanadium, columbium and tantalum, confining said molten aluminum in a low-temperature pool in contact with said wick element, heating said wick element to a temperature higher than the temperature in said pool, evaporating by said high temperature that aluminum which wets said wick element, shielding said substrate from radiation emanating from the low-temperature pool of molten aluminum, and moving said substrate past said wick element to coat aluminum on said substrate.

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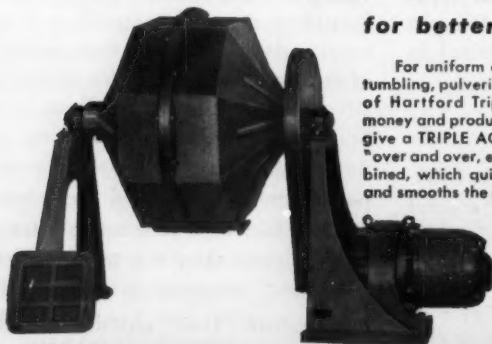
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Vacuum Metallizing

U. S. Patent 2,665,226. Jan. 5, 1954.
P. Godley 2nd, P. J. Clough and R. A. Stauffer, assignors to National Research Corp.

A process for coating a substrate with aluminum by vacuum-evaporating said aluminum and condensing said aluminum on said substrate, said process comprising the steps of providing a source of said aluminum in a vacuum chamber, evacuating said chamber, melting at least a portion of said aluminum in said source of aluminum, providing a wick element which is wettable by said aluminum, said wick element being substantially inert to molten aluminum and having at least a surface stratum comprising a compound selected from the class consisting of the nitrides and carbides of the metals titanium, zirconium, hafnium, vanadium, columbium and tantalum, confining said molten aluminum in a pool in contact with said wick element, heating said wick element to a temperature higher than the temperature in said pool by passing an electric current in series through said wick element and said aluminum in said pool, said wick element having a high resistivity as compared to said aluminum, evaporating, by said high temperature, that aluminum which wets said wick element, and moving said substrate past said wick element to coat aluminum on said substrate.

Vacuum Metallizing

U. S. Patent 2,665,228. Jan. 5, 1954.
R. A. Stauffer, assignor to National Research Corp.

A process for coating a heat-sensitive plastic substrate by vacuum-evaporating aluminum and condensing aluminum vapors on the substrate, said process comprising the steps of providing a plurality of coating stations in a vacuum chamber, evacuating said chamber, evaporating aluminum in said chamber, moving said substrate past said coating stations, contacting said substrate by a stream of aluminum vapors during movement past each of said coating stations, substantially immediately after passing each coating station bringing said metal coating in contact with a surface cooled to a temperature below about 0° C. and maintaining said metal coating in contact with said cooled surface until substantially all that heat is removed from the substrate which was transmitted to said

substrate by the metal vapors which condensed to form said metal coating, and maintaining at a temperature above about 1300° C. those vapors contacting said substrate prior to the time when it has a reflectance of about 70%, the metal coating applied at each coating station being brought into contact with said cooled surface in less than about one second after formation thereof.

Vacuum Metallizing

U. S. Patent 2,665,229. Jan. 5, 1954.
F. W. Schuler, W. W. Mansir and W. O. Di Pietro, assignors to National Research Corp.

The process of coating a substrate with aluminum which comprises providing a vacuum chamber in which aluminum may be evaporated under a vacuum, positioning said substrate within said vacuum chamber, providing a support comprising elemental carbon, providing a supply of aluminum and a second metal on said support, said second metal being taken from the class consisting of titanium, zirconium and tantalum, heating said aluminum and said second metal to a temperature above the melting point of said aluminum, said second metal being provided in an amount by weight equal to about 4% of the aluminum on said support, thereafter substantially continuously feeding aluminum to said support as said aluminum evaporates feeding said second metal to said support separately and simultaneously with the aluminum feed, said second metal being fed at a rate such that its weight is between about 1% and 5% of the weight of aluminum being fed at any period of time, heating said support to a sufficiently high temperature to vaporize aluminum on said support, advancing said substrate past said support, and condensing on said substrate aluminum vapors emanating from said support.

Flexible Oxide on Aluminum

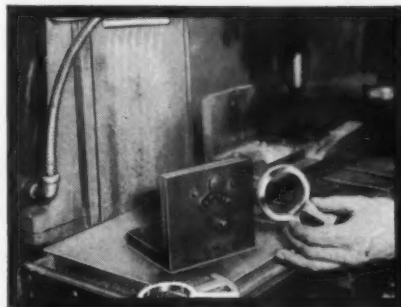
U. S. Patent 2,665,243. Jan. 5, 1954.
G. W. Young and J. I. Hain, assignors to General Electric Co.

The method of providing an aluminum surface with a flexible oxide coating which comprises anodically oxidizing the surface in a dilute aqueous solution of oxalic acid and thereafter immersing the oxide-coated surface in a flexing bath consisting of an aqueous solution of oxalic acid at a temperature of from about 80° C. to 95° C.

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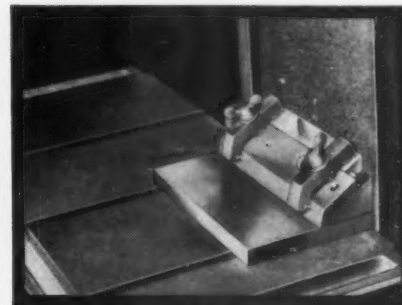
● Facing this thin wall bronze casting formerly took 9 min. on engine lathe — now takes 2 min. on wet-belt grinder.



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Recent Developments

New Methods, Materials and Equipment
for the Metal Finishing Industries

Bright Nickel Process

*Wagner Bros., Inc., Dept. MF, 400
Midland Ave., Detroit 3, Mich.*

A vastly superior, new bright nickel process has recently been developed by the above manufacturers of electroplating equipment and supplies, it was revealed recently by *John D. Tebben*, vice-president.

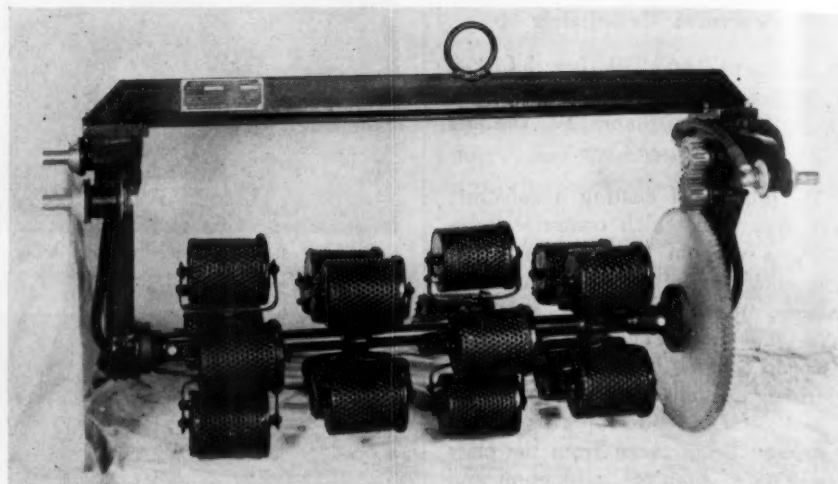
The new nickel brightening process is called *Wabrite* and was developed as a result of extensive research at the company's laboratory, working in close collaboration with the research staff of a well-known Mid-western university.

The new process allows extremely high tolerances for impurities without impairing the quality of finish. Leveling, hiding and ductility are unmatched by any known process. Excellent throwing power (up to 100 amps./sq. ft.) permits uniform plate deposition into recesses. In addition, it furnishes a highly active nickel deposit, ideal for subsequent chrome plating. Conversion of present baths is easily made without loss of nickel bath or primary brightener.

Cluster Plating Barrel

The Udylyte Corp., Dept. MF, Detroit 11, Mich.

The Cluster Barrel provides a rotary rack to hold small containers with the proper constant current conducted to each container. The mechanism consists of a shaft rotated by means of a large ring gear. On the shaft are mounted, at intervals of about eight inches, four spoke arrangements. Each spoke carries a perforated steel plastic covered container held in place by "C" shaped spring clips which also serve to hold the removable lid in place. For loading and unloading, the small containers are easily snapped out of the clips and the lids are simply lifted off the containers. Each con-



tainer has a built-in disc type cathode contact making it a complete unit in itself.

The barrel with its bail type superstructure can be used in the standard plating barrel. It is particularly well adapted to the plating of business

machine, radio, radar parts or any such products where plating is required and the parts must be kept separate. It is also of good use to anyone plating small delicate parts which cannot stand the tumbling action of standard bulk plating equipment.

Carbon Pile Rheostat

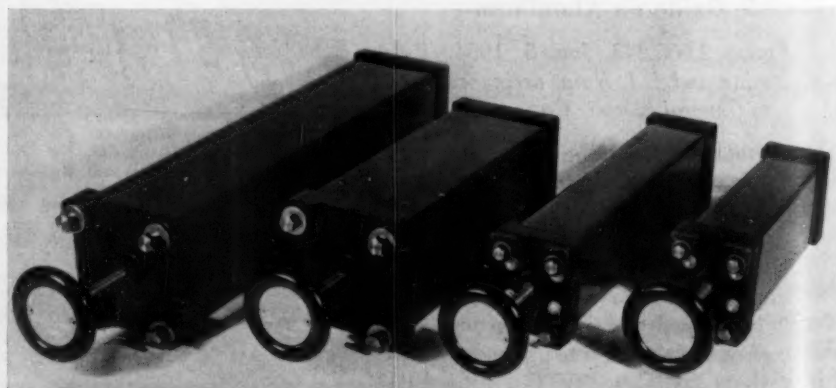
*Hanson - Van Winkle - Munning Co.
Dept. MF, Matawan, N. J.*

The improved carbon pile rheostats have been built on a unique principle of construction, are considerably more compact than conventional carbon pile rheostats, and generally perform better, especially at high amperages.

Designed for use in electroplating installations, the new rheostats however, could be used in any low voltage,

high current application where stepless control is desired. This would include, among other things, general testing work — testing automotive and aeronautical equipment, for example.

Unlike the conventional multiple-tube carbon pile rheostats, the H-VW-M rheostats are built of rectangular carbon plates formed in a single pile and housed in a one-piece steel box. They are rated from 25 to 250 amps on continuous service, with higher ratings when loads are intermittent. Re-



distance changes range as high as 50 to 1.

Proportioned for moderate temperature rise, the new rheostats operate at lower temperatures than the multiple-tube or standard rheostats. Their cases are insulated and the rheostats are suitable for mounting on metal or insulating panels.

These rheostats are designed for use as part of an electrical circuit. For correct application, the company suggests furnishing, with inquiries, complete details as to exciting potential and other elements of the circuit.

Phosphate Coatings

*Cowles Chemical Co., Dept. MF,
7016 Euclid Ave., Cleveland 3, O.*

The above manufacturer of industrial chemicals, announces an entirely new zinc phosphate coating, Ty-Bond, which is now available to the metal finishing trade.

This is the first new zinc phosphate coating to be introduced in many years because it is amorphous, whereas most of the other coatings on the market until this time were crystalline. It forms a smooth, dense, and hard coating to the basis metals. Exceptionally adherent and durable, the coatings cannot be removed, cracked, or damaged in any way by severe bending or flexing.

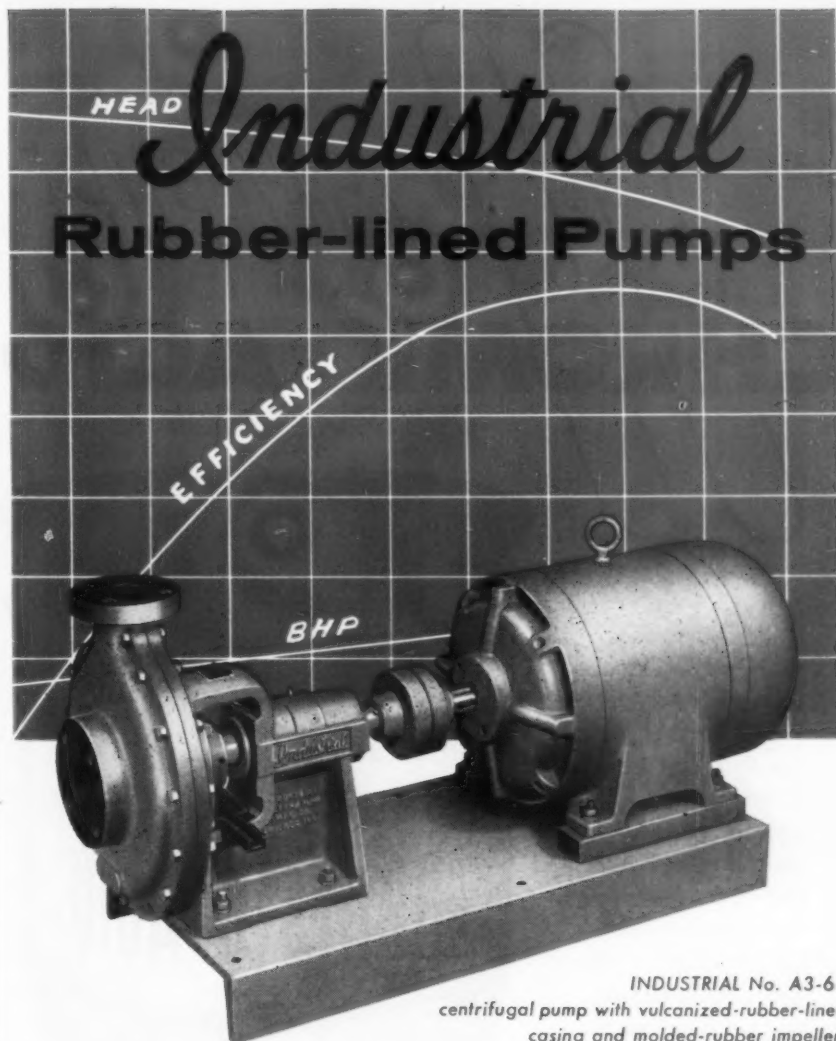
Compounded under entirely new formulations, the coatings cause a chemical reaction on the metals being coated, integrating themselves with the metals to form a denser, harder coating for better, more complete rustproofing. The coatings are non-sludging, also, making application easier and more economical. More than 90% of the chemical purchased is incorporated into the surface treatment of the metal being coated.

The new amorphous zinc phosphate coatings are available in several different types to provide a wide range of coating weights. All government specifications can be met.

Adhesive for Metallized Plastic

*Adhesive Products Corp., Dept. MF,
1660 Boone Ave., New York 60, N. Y.*

The above firm announces the development of a new transparent adhesive for adhering metallized plastic. Designed No. 3799 Metagrip, this new adhesive when used on metallized acetate, butyrate, or polystyrene, does not cause the metallic finish to peel or run.



INDUSTRIAL No. A3-65
centrifugal pump with vulcanized-rubber-lined
casing and molded-rubber impeller.
Base has rubber-covered floor.

for corrosive and noncorrosive liquids

The latest in pump engineering and design is incorporated in INDUSTRIAL centrifugal pumps for maximum efficiency and severe, continuous service. Lined with soft rubber for abrasive slurries or hard rubber as specified, balanced rotating assembly mounted in ball bearings, corrosion-proof stuffing box to permit external liquid seal if required, easily removable packing gland nut and ample space for repacking stuffing box, simple adjustment of impeller clearance are some of the features.

These pumps are made in a range of sizes with capacities up to 240 gpm., operating heads up to 240 feet, and $\frac{3}{4}$ to 15 hp. They are furnished either with or without base, motor, and coupling

Complete Information on Request

5150

INDUSTRIAL

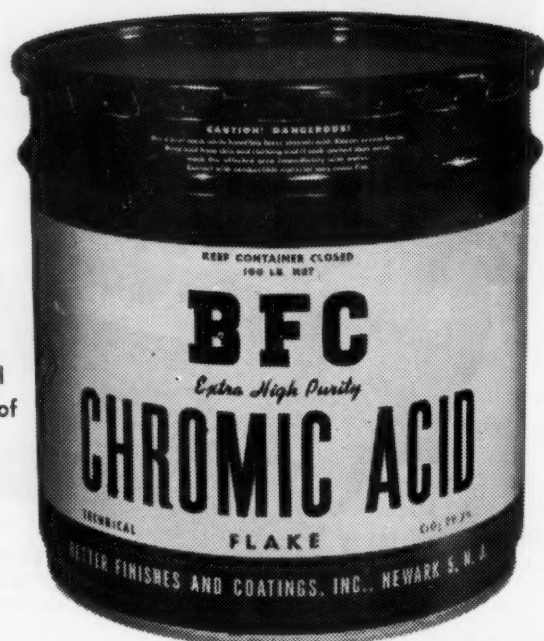
FILTER & PUMP MFG. CO.

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HEAT EXCHANGERS
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75+% PURE CHROMIC ACID

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Ownership-management make the difference! We say exactly what we can do...and then do it without alibis or buck-passing. We think you'll like the uniform quality of BFC Chromic Acid and the single-standard-of-service behind it. When you're in the market, why not telephone us at Market 3-2663?

BETTER FINISHES & COATINGS, INC.

268 Doremus Avenue, Newark 5, N. J. • 122 East 7th St., Los Angeles 14, Calif.



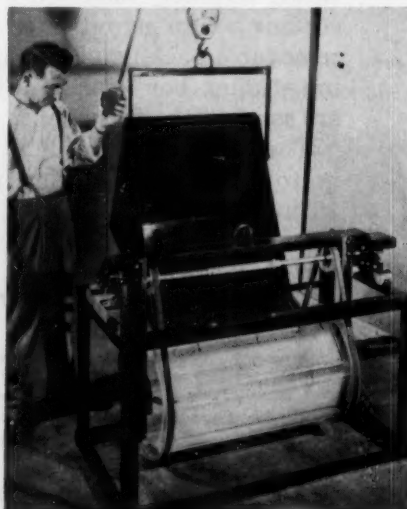
With the new adhesive, it is also possible to adhere ordinary plastic to metallized plastic, such as metallized acetate. It is fast-drying, and bonded materials can withstand considerable shock. It can also be used to adhere plastic to metal, making possible the manufacture of unique novelties, toys and plastic household items.

Plating Barrel Loader

The G. S. Equipment Co., Dept. MF, 5317 St. Clair Ave., Cleveland, Ohio.

Newest accessory developed for the recently introduced Gill-Singleton plating barrel, is a handy, semi-automatic loading chute and cylinder support stand. Primarily designed for the firm's barrels, it is manufactured in various

sizes to fit all makes of cylinders and superstructures. Simplicity of opera-

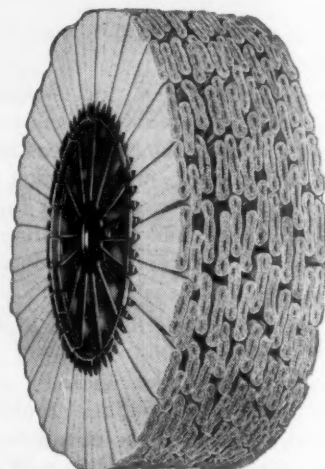


tion, versatility and rugged all-welded construction are featured at moderate cost. The receiving end of the chute is flush with floor level for easier loading of materials to be cleaned or plated. It operates with any type hoist, and is quickly attached to the hook at waist height without stooping. It tilts automatically as it lifts, discharging a full load into the cylinder in one operation.

An exclusive feature is the Plastisol-coated lip for preventing injury to cylinders. The loader is available for prompt shipment, complete with chute and cylinder support stand, assembled ready to use. Complete information and prices will be mailed on request.

Extra-Flexible Sisal Buff

American Buff Co., Dept. MF, 2414 So. La Salle St., Chicago 16, Illinois.



The answer to one of the most important buffing problems is provided in the flexibility of the new "Automatic Unit Sisal Buff" now available.

The unique, extra-flexible "unit" design of the new buff provides the perfect solution for getting into crevices and contoured surfaces, making possible faster, better-quality production on both flat and curved jobs.

The new buffs are constructed of fast-cutting, top grade sisal fibres, locked together by the exclusive "Permanizing" process that eliminates loose ends and scratching. Cloth wrapped around each unit assures longer wear. Because of the unit construction, air is continually circulated throughout every fibre for cooler running, even in high speed operation, eliminating heat discoloration.

Especially recommended for fast.

hard cutting of brass, stainless steel, carbon steel and aluminum, the new buff is available in both the "air-conditioned" permanent center models and the patented centerless construction.

Acid and Plating Hose

Carl Buck and Associates, Dept. MF,
Essex Fells, N. J.



A new line of hose designed to handle hot acids and all plating solutions is now available for shipment out of stock in sizes of 1", 1½", 2" and 2½" ID. Larger sizes can be provided if needed on reasonable delivery schedules.

This hose is designated as Camac Acid and Plating Hose and is constructed of butyl rubber with 4 ply reinforcing. Tests have proven the ability of this hose to stand up under all hot acids except nitric or chromic. Further tests show that the hose does not contaminate plating solutions.

Suitable fittings and stainless steel hose clamps for this hose are also in stock for immediate shipment.

Descriptive data sheets and prices are available on request.

Barrel Finishing Media for Fragile Parts

Rampe Manufacturing Co., Dept. MF, 3320 St. Clair Ave., Cleveland 14, Ohio.

The above firm announces the development of Nylaslugs (molded nylon tumbling media) for use in deburring



and polishing fragile parts such as injected molded plastics, small parts from zinc, brass or aluminum, jewelry parts, etc.

The process used will vary with the product but generally it consists of using the slugs with an abrasive of proper roughness. After thorough rinsing the slugs are used with a polishing cream, after which they are tumbled with clean hardwood sawdust.

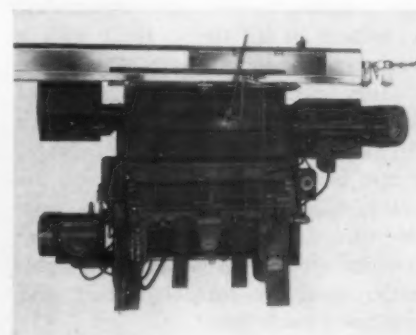
The new slugs are available in various shapes and sizes as may be best suited for the parts to be deburred and polished.

Spray Buffing Compound Applicator

Clair Mfg. Co., Inc., Dept. MF, 1009 South Union St., Olean, N. Y.

The Spray Gun Mover, a hydraulic-

ically-operated device for applying surface finishing compounds to wide faced buffs, has been introduced by the above company. This machine which will operate efficiently on any standard surface finishing machine, is covered by U. S. Pat. No. 2,677,219 recently issued.



When Electro-Cleaning.. ..get ALL these results!

1. **FAST, EFFECTIVE CLEANING** insured by the ability of the cleaning solution to carry high current densities.
2. **MINIMUM CLEANING COSTS** resulting from long-lived cleaning solutions.
3. **FLEXIBLE OPERATION** from the use of a cleaner that can be employed for either anodic or cathodic cleaning.
4. **DOUBLE-ACTING RESULTS** from a cleaner that works chemically as well as electrolytically.
5. **NO ATTACK ON METALS** by making sure that your cleaner is safe for the metals you process.

Magnus makes a complete line of Electro-Cleaners. You can get ALL these results on *your* work by using the Magnus material that has demonstrated its superiority on aluminum, soft metals, die cast, steel or combinations of any of these metals.

The Magnus laboratory is always ready to make test runs on your particular metal units to determine which Magnus Electro-Cleaner is best suited to your work.



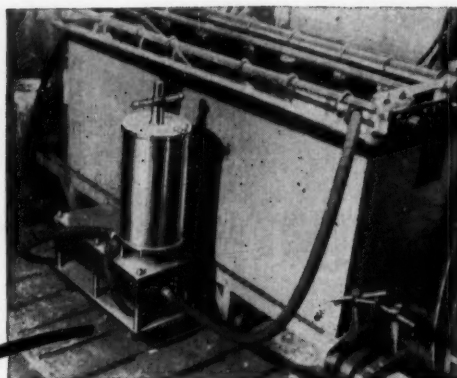
MAGNUS CHEMICAL CO., INC.

11 South Ave., Garwood, N. J.

In Canada—Magnus Chemicals, Ltd., Montreal

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CHECK the advantages



✓ of using a "Sealed-Disc" Filter

**YOU'LL
be impressed too
with these proved performance
features.**

Models for any size or type installation in Stainless Steel, Monel Metal, Plain Iron, etc.

Small, compact — requires exceptionally small floor space coupled with remarkable filtering speed and volume.

Completely enclosed and air tight — eliminates loss of liquid from dripping.

"Sealed-Disc" Filters are complete as shown — slurry mixing tanks are not needed — filtering powders are not generally required.

Simplicity of design assures savings in operating time and labor with positive trouble-free performance.

Every plater who uses a "Sealed-Disc" Filter is impressed with its positive, trouble-free performance.

Regardless of the size or type of your plating installation, there's a "Sealed-Disc" Filter "to fit your job" — you can depend on these proved performance features — you can be sure that all dirt, sludge, and even the invisible impurities are removed from your plating solutions.

"Sealed-Disc" Filters were designed especially to meet plating room requirements. They are smaller, more compact and portable than ordinary Filters, yet they are capable of handling equal volumes of solutions. Ask your regular plating supplier to tell you about the "Sealed-Disc" Filter that has helped so many platers get better finished plated work with savings in time and labor — or write for details.

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ENGINEERING CORPORATION

909 Bright Street

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Other Alsop plating room equipment

We manufacture a full line of Mixers and Agitators covering a complete range of sizes, for mixing, blending and dissolving. Stainless Steel Mixing Tanks are also available in a wide range of capacities. For full details and illustrations write for your free catalogue.

In operation, the spray gun mover completes one spray pass each time the operator touches the foot control. The equipment is available in a variety of sizes — the largest permitting a coverage of from 2" to 40". A single gun covers the entire width, and a dependable supply of clean, dry, oil-free air is assured at all times. Built with a minimum of moving parts, the device is easily installed and in all cases is of shorter width than the equipment being serviced. Basic components include: frame, bearing mounted carriage, air motor, rack and pinion drive, adjustable cam actuated traveling air valve to which spray nozzle is attached, automatic electrical control circuit and dust-proof enclosure.

Trichlorethylene Solvent

E. I. duPont de Nemours and Co., Inc., Dept. MF, Wilmington 98, Delaware.

Company plants at Niagara Falls, N. Y., and Wyandotte, Mich., are starting to ship a new grade of "Triclene" D trichlorethylene vapor degreasing solvent to metalworking customers and distributors throughout the country.

Trichlorethylene has been under continuing long-term research aimed at increasing its effectiveness. The current improvement increases the stability of the solvent and helps it retain its purity under the most adverse conditions.

The principal change in the new sol-

vent has been the addition of a completely new, balanced stabilizer. The new formula provides a higher level of resistance to the deteriorating action of oils, greases, and many other compounds found on metal parts. Among other things, the improved product is particularly resistant to the action of aluminum or other active metals.

Introduction of the improved solvent does not involve any change in price, the company said.

750 amp. Selenium Rectifier

The Crown Chemical and Engineering Co., Dept. MF, 4722 Worth St., Los Angeles 63, Calif.



Recently announced is a new 750 ampere selenium rectifier type plater identified as Model No. 6-750T. This unit is provided with a 22-step control handling the DC output voltage range from 0-6 volts. The unit is designed for 230/460 volts, three-phase, 60 cycle AC input and has the overall dimensions of 66" high x 22" deep x 22" wide. In addition to a magnetic starter with overload protection, a 4 1/2" ammeter and voltmeter are also provided.

This plating rectifier unit features a new type of down-draft ventilation design with an airflow switch to provide protection in the event of failure of the forced draft system. The DC ripple of the unit is 5% maximum and the approximate overall weight is 800 lbs.

Protective Tape

Minnesota Mining and Mfg. Co.,
Dept. MF, 900 Fauquier St., St. Paul
6, Minn.

A new paper-backed protective tape is 100% resistant to outdoor exposure for protecting smooth surfaces during storage and fabrication.

Tradenamed "Scotch" brand protective tape No. 344, the new black paper tape is believed to be the first tape of its kind to be entirely resistant to outdoor weathering for periods up to six months in duration.

The tape—designed to protect polished and finished surfaces against scratches and die marks during and after fabrication, shipment and stor-



age—features a film-like adhesive that sticks immediately upon contact to such materials as stainless steel, aluminum (not anodized), glass, most plated metals, plastic glass, polystyrene, and polyester.

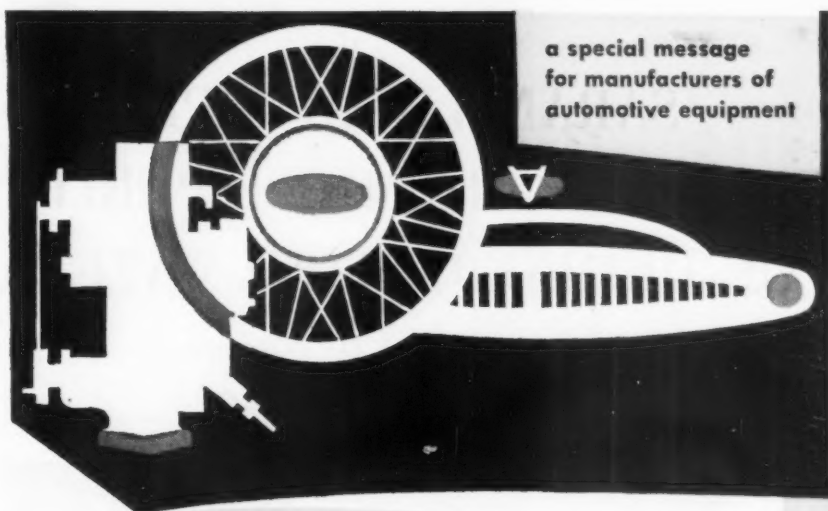
Although the tape's black paper backing resists abrasion, occasional fractures in the backing do not harm the rubbery adhesive which stretches to continue protecting the covered surface during storage and fabrication.

The new No. 344 tape is being made available in 100-yard rolls in standard widths of 12-, 24-, and 36-inches, with other widths available on special order from distributors nationally. It is being offered in addition to the present No. 343 tape that is available for jobs not requiring a weather-resistant tape.

Barrel Nickel Brightener

Platers Research Corp., Dept. MF,
59 E. 4th St., New York 3, N. Y.

A 30 to 100 per cent increase in the corrosion resistance of barrel nickel



a special message
for manufacturers of
automotive equipment

need a finish for low cost
corrosion protection or
showroom sparkle?

specify

IRIDITE®

Whether you're finishing non-ferrous parts for high corrosion protection, paint base, or for showroom sales appeal, you can be sure of low material and production costs and peak performance when you specify Iridite. Here's what you can do with Iridite:

ON ZINC AND CADMIUM you can get highly corrosion resistant finishes to meet any military or civilian specifications and ranging in appearance from olive drab through sparkling bright and dyed colors.

ON COPPER ... Iridite brightens copper, keeps it tarnish-free; also lets you drastically cut the cost of copper-chrome plating by reducing the need for buffing.

ON ALUMINUM Iridite gives you a choice of natural aluminum, a golden yellow or dye colored finishes. No special racks. No high temperatures. No long immersion. Process in bulk.

ON MAGNESIUM Iridite provides a highly protective film in deepening shades of brown. No boiling, elaborate cleaning or long immersions.

AND IRIDITE IS EASY TO APPLY. Goes on at room temperature by dip, brush or spray. No electrolysis. No special equipment. No exhausts. No specially trained operators. Single dip for basic coatings. Double dip for dye colors. The protective Iridite coating is not a superimposed film, cannot flake, chip or peel.

WANT TO KNOW MORE? We'll gladly treat samples or send you complete data. Write direct or call in your Iridite Field Engineer. He's listed under "Plating Supplies" in your classified telephone book.

Iridite is approved under government specifications



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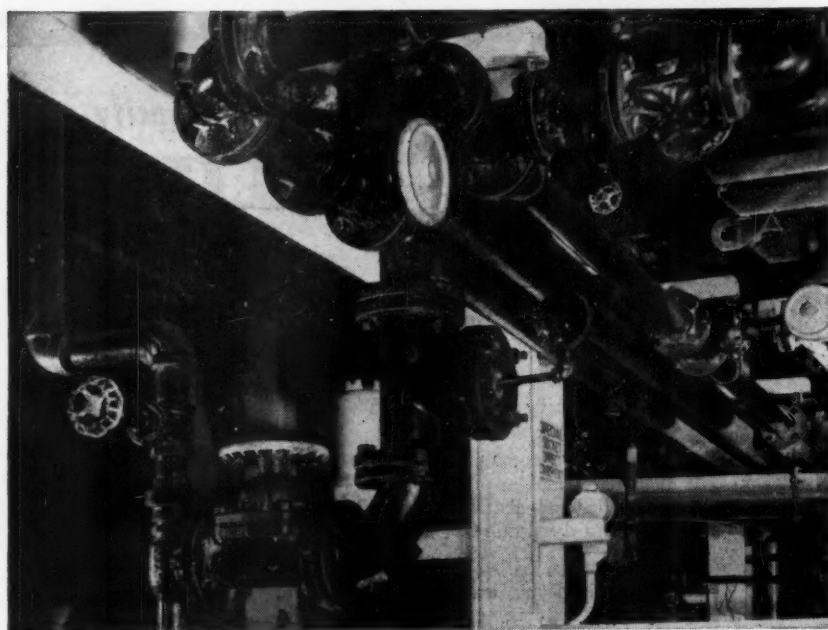
4004-06 E. MONUMENT STREET • BALTIMORE 5, MD.

Manufacturers of Iridite Finishes for Corrosion Protection and Paint Systems on Non-Ferrous Metals, ARP Plating Chemicals.
WEST COAST LICENSEE: L. H. Butcher Co.



SARAN LINED PIPE PROTECTS CHEMICAL PURITY OF DEMINERALIZED WATER

It's also resistant to corrosion
in water-treatment process



This trouble-free installation, in a chemical plant, is only one example—many manufacturers are finding saran lined pipe, fittings and valves ideal for use in the conveying and processing of demineralized water.

These installations protect the *chemical purity* of demineralized water—a necessity for top-quality control in chemical manufacturing. In addition, their resistance to corrosion by most chemicals eliminates costly shut-down.

And saran lined pipe is easy to install. It can be cut and threaded in the field. No special tools or handling is needed, downtime is kept to a minimum.

If your production requires the transporting of liquids without contamination, investigate saran lined pipe, fittings and valves today.

RELATED SARAN PRODUCTS—Saran rubber tank lining • Saran rubber molding stock • Saran pipe and fittings • Saran tubing and fittings.

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2415 Burdette Ave., Ferndale, Mich.

Please send me a copy of your catalog on
saran lined pipe, valves and fittings.

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SP 1166C

you can depend on **DOW PLASTICS**



plated steel parts was recently shown in a series of tests of a newly improved formula of Nickelite brightener, conducted under standard salt-fog conditions by the manufacturer. Comparison of parts plated in solutions containing the brightener with parts plated in standard nickel solutions resulted in improved corrosion resistance of 30% for minimum deposits of nickel, and up to 100% for thicker deposits. Coupled with this improvement, according to the manufacturer, is the elimination of the usual brittleness of nickel finishes, and an accompanying attainment of maximum brilliance of the surface.

As a result of the tests, the newly improved brightener has been prepared for national distribution with special emphasis on economy. The product is now packaged in quadruple-strength concentrate in quart bottles, to eliminate the necessity to ship and handle carboys or other larger containers. Packed four quarts to a carton, the new packaging is said to reduce shipping weight 275%.

The new bottle is provided with a no-drip lip to facilitate the use of the brightener concentrate, which can be measured in the bottle cap for addition directly to the plating solution. The user can also dilute the concentrate with water to make a normal-strength solution before addition to the plating tank.

Epon Resin-Type Coating Stripper

Northwest Chemical Co., Dept. MF,
9310 Roselawn, Detroit 4, Mich.

The above manufacturer announces Liquid Stripper No. 9—a new compound designed specifically to remove a wide variety of epon resin base coatings.

The stripper will effectively strip epon finishes from both ferrous and non-ferrous metals at temperatures ranging from room to 190°F. at time cycles from two minutes to two hours.

With the exception of aluminum which it will etch, the material will not attack the base metal. It is non-corrosive thus allowing its use in plain steel tanks. It is economical and easily-controlled. As with any Hi pH solution, it should be handled with care. It presents no fire hazard in that it will not flash even at boiling temperatures but should be used with adequate ventilation.

Alkaline Deruster

Oakite Products, Inc., Dept. MF,
118 Rector St., New York 6, N. Y.

A new development is Oakite Rustripper, designed for alkaline derusting of precision parts where dimensional change and acid embrittlement must be avoided. In addition to removing rust and heat scale from ferrous metals, this material has also proved effective in certain cases for descaling heat-treated titanium in aircraft plants.

The product is a heavy-duty, off-white powder that may be used in hot or cold solutions. It may also be used with direct current to remove deep-pitted rust, or reverse current to remove heat scale. Among the advantages claimed for this material are (1) It will not attack sound metal; (2) It will not cause hydrogen embrittlement; (3) It does not require special equipment, such as stainless steel tanks; (4) It assures safety of regular equipment; (5) It creates no troublesome fumes; (6) It may be disposed of in the same manner as any highly alkaline solution; (7) It strips certain types of paint at the same time as it removes rust; and (8) It protects against re-rusting.

Non-Etching Aluminum Cleaner

Enthone, Inc., Dept. MF, 442 Elm St., New Haven, Conn.

Recently announced is the development of a new detergent for rapid cleaning of aluminum. This product is called "Aluminum Cleaner NE-6." It is stated to be mild in alkalinity, does not etch metals either at the air interface or in contact with other metals, and at the same time possesses very high detergency. It is claimed to have remarkable ability to disperse oils and to remove marking ink and crayon normally present on aluminum sheet. The cleaner is recommended for cleaning cast and wrought aluminum prior to anodizing, chromate treatments, organic finishing, resistance welding and plating by the non-etching process.

The cleaner can be put in steel or stainless steel containers, and it is normally used in the concentration range from 6-8 oz./gal.

Floor Surfacers Trial Kit

Pennsylvania Salt Mfg. Co., Dept. MF, 1000 Widener Building, Philadelphia 7, Pa.

Maintenance and safety engineers

Pollution abatement has passed from the 'Talking' to the 'ACTING' stage

These two timely
bulletins will help you act
on your waste problem



Here's useful information
on waste treatment ...
including equipment
description, specifications,
flow diagrams and actual
case histories of plating,
refinery, metal finishing,
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These bulletins are
yours for the asking.

ACT NOW...
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Please send Infilco Bulletins Nos. 70-MF and 850-MF.

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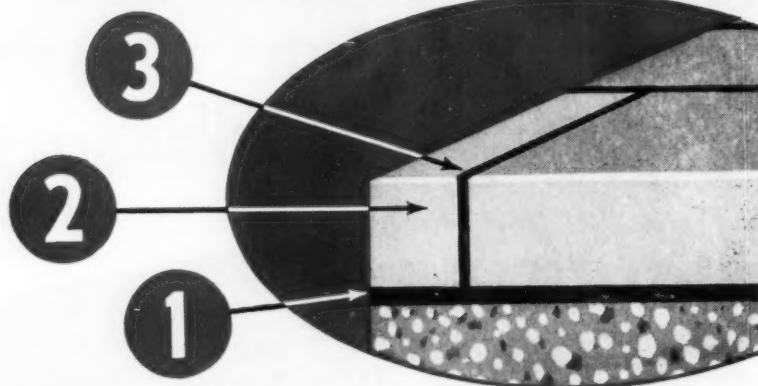


INFILCO INC. Tucson, Arizona

Plants in Chicago and Joliet, Illinois

FIELD OFFICES IN 35 PRINCIPAL CITIES
IN THE U.S., CANADA AND MEXICO

Low Initial Cost — Negligible Maintenance Protection Against BOTH Acids and Alkalies in "U.S." BRICK FLOORS



A "U. S. Triple Construction" Corrosion Resistant Brick Floor provides complete protection against acid and alkali attack for practically an unlimited number of years — usually without maintenance expense of any kind.

First, an impermeable membrane of U. S. Stoneware's "RESILON" is applied over a 4" to 6" rigid sub-base. Chemically-resistant, non-porous, and flexible, Resilon protects the subfloor against acid seepage. Then split or full size "USSCO" Acid Brick (depending on the load) are buttered with "DURISITE" Cement and laid with joints $\frac{1}{16}$ " to $\frac{1}{8}$ " thick.

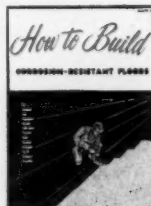
"USSCO" Acid Brick are dense, strong, resistant to erosion and spalling. Accurately shaped to lay tight and flat. "DURISITE" Cement sets quickly by chemical action — resists both acids and alkalies, as well as oils, greases, solvents and water. Completely non-porous, it bonds brick tightly with wafer-thin joints. Durisite is non-toxic, safe for workmen to use, and stable in storage.

YOUR OWN MASONS CAN LAY A "U.S. TRIPLE CONSTRUCTION" FLOOR

We will provide the materials for your own workmen to install a "U. S. Triple Construction" Floor, or if you prefer, we can handle the installation of the complete floor.

Write for this free book!

Detailed construction drawings showing approved methods of building floors, trenches, gutters, tank and motor supports, etc., with full technical data, photographs and case histories. Ask for Bulletin AB-17.



413C



PROCESS EQUIPMENT DIVISION

will be able to test Pennsalt NeoFloor, the new industrial skid-proof surface introduced by the company earlier this year, without guesswork as to the quantity of the materials necessary for a complete job. A trial kit, sufficient to surface an area of 30 square feet, is now available through the authorized representatives of the company's Corrosion Engineering Products Department.

The complete kit offers virtually every type of industrial operation an opportunity to try the material without needless stocking of excess quantities of any item.

Providing comfortable footing and long-lasting surfaces under heavy traffic, the surfacer, a grit-like material anchored in a matrix of resilient neoprene and bonded firmly to the floor or other surface covered with an adhesive primer. Application is easy. Both primer and coating are supplied in a quick-drying liquid form and can be applied with brush or roller on concrete, steel, wood, or other common flooring surfaces.

Tests have proved the product to resist fumes, acids, alkalies, salt solutions and solvents at temperatures up to 220°F. The new coating is also im-

pervious to oils and greases and is easily cleaned with commercial detergents and cleaners. A wide range of grit sizes to meet individual requirements is available.

The trial kit, which sells for \$15.00 consists of: 1 gallon of NeoCoat Gray, 1 pint of NeoPrime B, 1 pint of NeoCoat thinner, and 10 pounds of grit. Complete instructions, specifications, and price lists of these items in larger quantities are included. The materials are available in one-gallon and five-gallon containers.

Hooks for Lead Anodes

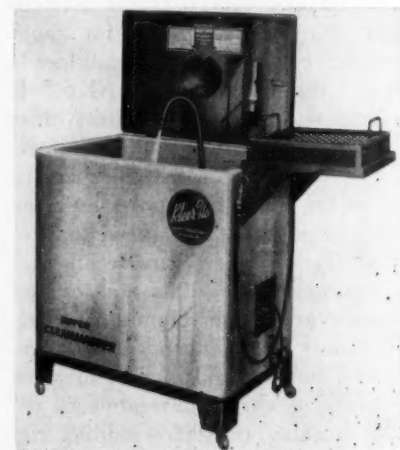
Heil Process Equipment Corp., Dept. MF, 12901 Elmwood Ave., Cleveland 11, Ohio.

Recently announced is the addition of two standard hooks for the manufacturer's complete line of lead anodes used in chromium plating operations.

These hooks are designated as #12 and #12A, and both are heavier than any previous anode hook offered to the electroplating trade. These hooks will be used only on the Super-X and Super-XX style lead anode. Both hooks are $\frac{3}{8}$ " x 2" in cross section and are principally designed for use with rectangular bus bars, but can also be used with round bus bars.

Automatic Solvent Degreaser

The Klee-Flo Co., Dept. MF, 250 West 57th St., New York 19, N. Y.



A new, automatic cold washing degreaser, designated as the Super Cleanmaster Model 50, has been announced. The machine employs a powerful turbulent action created by compressed air which combines with the penetrating chemical properties of the cleaning compound, enabling it to remove heavy deposits of oil, dirt, grease and chips from all types of metal parts.

GOLD SALTS

BY AUROMET

Auromet Gold Salts are made from U. S. Treasury gold to insure purity and uniformity.

Auromet Gold Salts are manufactured in our modern plant by skilled scientific craftsmen following the trade's most exacting specifications.

Auromet Gold Salts are available in 67.5%, 67%, 50%, 46%, 41% gold and any other lower percentage.

Auromet Corporation also manufactures Bright Gold, Silver, Silver Cyanide and Nitrate, Platinum, Palladium and Rhodium Concentrates.

For complete information and technical service call WORTH 6-0863 collect.



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CORPORATION

199 CANAL ST., NEW YORK 13, N. Y.

A patented electric pump prolongs the life of the cleaning compound by continuously filtering out dirt, chips, and abrasives. The machine is equipped with a full length air agitated soaking tank, hinged work shelves, parts basket, drying shelf, and a compressed air gun for faster parts drying. Mounted on casters, the machine can be easily moved to any part of the shop for "on the spot" production or maintenance cleaning operations. It is reasonably priced at \$245.50, F.O.B. factory.

New Impregnated Buffs Cut Faster and Last 30% Longer

Hanson-Van Winkle-Munning Company, Dept. MF, Matawan, N. J.

An improved metal-finishing buffing wheel, is stated to cut faster than former company models and wear 30% longer. Tested during regular production runs, the new buff practically eliminates break-in time.



These two buffs, one Binderized and the other untreated, were run under identical conditions. The untreated buff (shown above) contains many holes and worn spots — the result of internal frictional wear. The Binderized buff (shown below) is undamaged as lubrication provided by the binderizing process greatly reduces frictional wear.



Called a Binderized Ruff-L-Buff, the new buff is impregnated with the same organic material that is used as a binder in buffing compounds. The cloth in the companies standard line of Ruff-L-Buffs is not impregnated, and the

Consider
these outstanding
features of

New Luster-on®

COBRA*

The Chromate Finish For
Producing Inhibited and
Lustrous Finishes on
Copper, Brass or Bronze.

- Produces a permanent lustrous finish even in recessed areas.
- Stands over 100 hours standard salt spray
- Assures very long life
- Can be handled immediately after treatment cycle — no staining or finger marks
- Replenishment required only to replace dragout
- Exhaust of bath in use is optional — not required
- Excellent paint bond qualities

Specify

New Luster-on®

COBRA

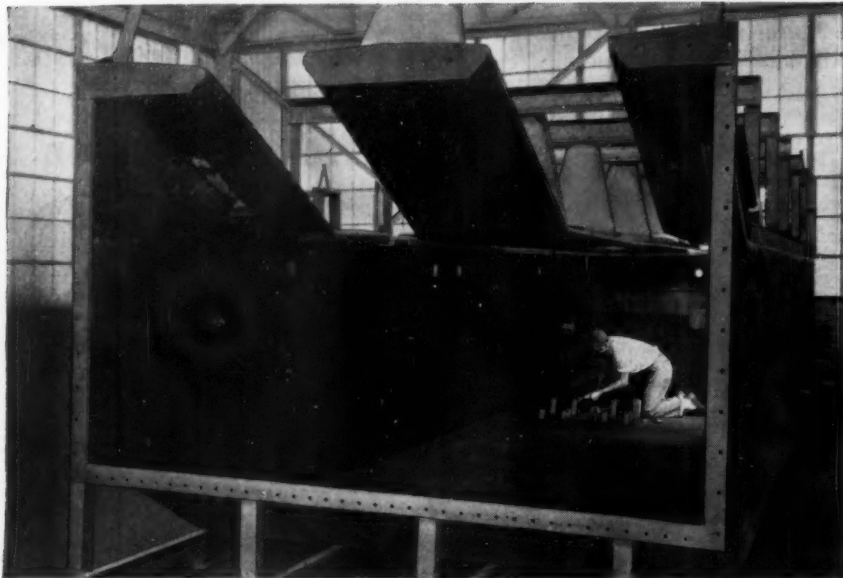
for

- Inhibited and lustrous finishes on copper, brass or bronze
 - Use on solid or plated copper or brass
 - Cleaning and deoxidizing copper and brass parts
 - Removing flux on soldered parts
- Luster-on — the first in the field and still the leader*

Write for full data sheets and send a part for free processing

*Patent applied for

THE *Chemical*
CORPORATION
58 Waltham Ave., Springfield 9, Mass.



more protection . . . more use per dollar **MANHATTAN RUBBER LININGS**

For pickling and metal plating . . . wherever corrosive acids and other chemicals are used, manufacturers specify Manhattan Rubber Linings. That's because Manhattan's more than 60 years' engineering experience has resulted in the most dependable and most economical rubber linings made in the industry today. Manhattan Rubber Linings are made of calendered sheets of non-porous natural or synthetic rubber in required thickness

and compounded to eliminate contamination, corrosion, and stray currents . . . to give longer, better service under severest conditions of use. Manhattan's exclusive rubber-to-metal bond eliminates cracking by contraction and expansion due to temperature changes. To detect any imperfections, all Manhattan Rubber Lined equipment is tested dielectrically under 15,000 volts before shipment to doubly assure satisfactory results.

RM-442

RUBBER LINING PLANTS AT PASSAIC, N. J. AND NORTH CHARLESTON, S. C.



MANHATTAN RUBBER DIVISION — PASSAIC, NEW JERSEY
RAYBESTOS-MANHATTAN, INC.

Manufacturers of Mechanical Rubber Products • Rubber Covered Equipment • Radiator Hose Fan Belts • Brake Linings & Blocks • Clutch Facings • Packings • Asbestos Textiles Engineered Plastic, and Sintered Metal Products • Abrasive & Diamond Wheels • Bowling Balls

two lines differ only in this respect.

Forming a natural bond between buff and cutting compound, the impregnated "binder" permits thread ends to retain the compound more easily, more quickly and in larger quantity. The more compound carried, the less frequently are additional applications required, and the faster the cut under all conditions.

Grease-like in nature, the binder also tends to make the buff softer and more flexible during operation. Laboratory tests show that constant flexing damages the cloth of conventional buffs in an area beginning 1" from the periphery, and the cloth becomes progressively weaker as the buff wears down. Tests also show that the softer

impregnated buffs wear as well on the last inch as the first (see photos).

Helping to hold frictional heat down is the self-ventilating design feature. The individual buffs have six holes punched in their fiber-board centers and 12 air channels stamped on the outer rim of the centers. During operations, air is force-circulated over the numerous ruffles of the buff.

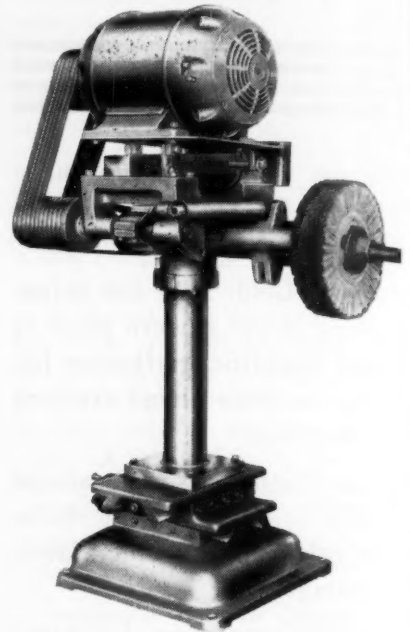
Cloth used in these buffs is cut on the bias to prevent unravelling and to provide more area and better adherence for the cutting compound. Other features of the buff are: perfect balance for uniform rotation and wear, steel-ring anchor to secure the cloth to the fiber-board center and exclusive Red-E-To-Use face that takes com-

pound without the customary surface preparation.

The new buffs are available in a wide variety of plys and weights with outside diameters of 12, 14, 16, and 18". Non-standard sizes may be had on request.

Polishing Head

*Hammond Machinery Builders, Inc.,
Dept. MF, 1601 Douglas Ave., Kalamazoo, Mich.*



The manufacturer announces a new heavy-duty, full-floating, adjustable polishing and buffing head and stand unit. The Model 52-100 will accommodate either a 10 or 15 HP, 1750 RPM motor or a 20 HP, 3500 RPM motor. Net weight of 2500 lbs. indicates the rugged construction necessary for heavy buffing jobs and to insure vibrationless operation resulting in more uniform finishes. It has a maximum "float" of 6" and can be furnished with power feed for vertical lift or horizontal traverse. This head unit, which can be assembled for either right or left hand operation, was designed especially for use with straight-line automatic buffing machines. It can also be used with rotary automatics or as individual polishing and buffing stands similar to polishing and buffing lathes.

Pre-Phosphating Metal Cleaner

Detrex Corporation, Dept. MF, Detroit 32 Mich.

Development of a new type of pre-phosphating metal cleaner to be used

in mechanical spray processing equipment, which is relatively neutral and contains no metallic activator, has been announced by the producer of industrial chemicals and metal cleaning equipment.

771 Paintbond cleaner was specifically designed for use in spray phosphate coating units where a fine-grained phosphate crystal is required. By accomplishing the activating process without resorting to metallic activators, it leaves the metal surface chemically clean and requires no surface seeding in the pre-phosphate coating stages.

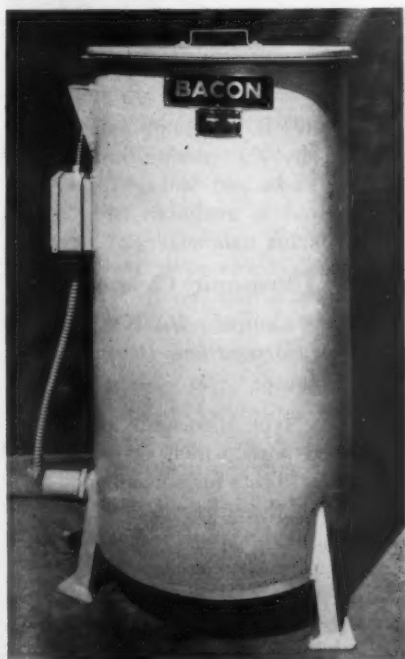
Subsequent phosphate coatings are extremely fine grained, uniformly coated and, thereby, result in lower chemical consumption, declared L. Camel, sales manager of the company's Chemical Processing Division.

In its formulation, the new cleaner has been designed to prevent excessive foaming at elevated temperatures and pressures. Field tests indicate that the operating cost is from 25 to 40 per cent lower than cleaners which contain metallic activators. It is available for immediate distribution.

Degreasing Tank

Bacon Vulcanizer Mfg. Co., Dept. MF, 1295 67th St., Oakland 8, Cal.

A new vapor-type degreasing tank for the degreasing of tools, engine parts, machine parts or any other metal items is now being marketed. Compact, rugged, requiring minimum shop space (40" height by 22" diame-



ter), the DG-1 degreaser tank is a handy unit for manufacturing plants, repairing shops, service stations, electroplaters, paint shops, etc. Completely operated by electricity, this tank reaches full vapor level within 15 minutes, with level controlled by thermostat and relay circuit and maintained to within 4" of tank top for uniform cleaning capacity. Interior easy to clean and coated with special corrosive-resistant material for durability. May be converted for use as hot tank.

Graphic Panel for Automatic Ion Exchange Equipment

Graver Water Conditioning Co., Dept. MF, 216 West 14 St., New York 11, N. Y.

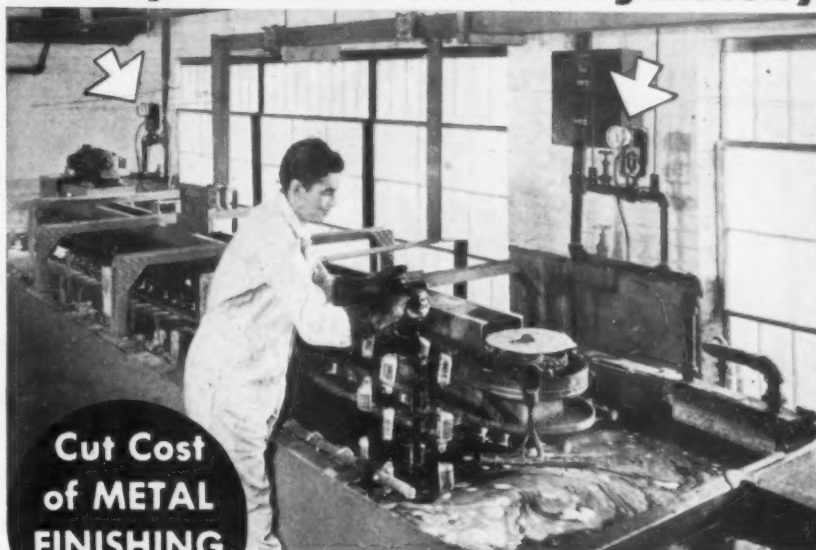
Now available is a graphic panel arrangement for all automatic ion ex-

change equipment that allows the operator to see at a glance if the system is functioning properly.

On the graphic panel control board is located, in addition to the usual controls, meters and recorders, a pictorial representation of the ion exchange units and the immediate piping and valves. Each valve representation has two colored lights, one red, one green. When the operation valve is open, the green light is on, when the valve is closed the red light is on.

All pipe lines are also lit and colored. There is a different color for each material being carried, such as acid, caustic, inlet water and outlet water. In cases where a line carries two different materials, a different color or pic-

Used by Leaders in the Plating Industry



**Cut Cost
of METAL
FINISHING
With**

POWERS

**NEW
Temperature REGULATOR**

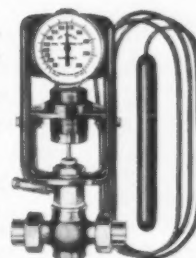
For Plating, Anodizing, Bonderizing, Pickling, Cleaning, Rinsing, and Chromate Dips. Powers No. 11-MF Regulators will help you get the most effective use from various solutions by holding them at the right temperature automatically.



Plastic Covered Thermal Bulb and Tubing—is highly resistant to solutions in above processes. Prevents electrical shorts. No insulators required for the regulator.

Easy to Read 4" Dial Thermometer—indicates temperature of liquid being controlled and makes it easy to adjust regulator for different temperatures.

Bulletin 330 describes this simple, dependable control.



THE POWERS REGULATOR CO., SKOKIE, ILL.
Offices in over 50 Cities, see your Phone Book (b51r)

Over 60 Years of Automatic Temperature and Humidity Control

A Greasless Compound that Counts

Count On
**SPEEDIE
SATIN FINISH**
Every Time!



IF YOU are having trouble with your *present* greasless compound sticking to the wheel — better try a tube of **SPEEDIE** Satin Finish.

You'll be glad you did!

Here's a product that *sticks to the wheel*, gives a finish that is unmatched and *saves you dollars* in these days when costs are so important.

Your polishers, too, will like **SPEEDIE** Satin Finish — it doesn't go down the blower — and, because it is *colored red*, the

buffer knows at all times just how much he has on his wheel.

SPEEDIE Satin Finish is available in all size grits, from No. 80 for polishing thru No. 400 for the finest finish.

Write today on your company letterhead for samples of **SPEEDIE** Satin Finish, advising grit size and number of tubes required. Don't forget to inquire about complete line of efficient and economical **SPEEDIE** Buffing & Polishing Compositions — in both bar and liquid form.

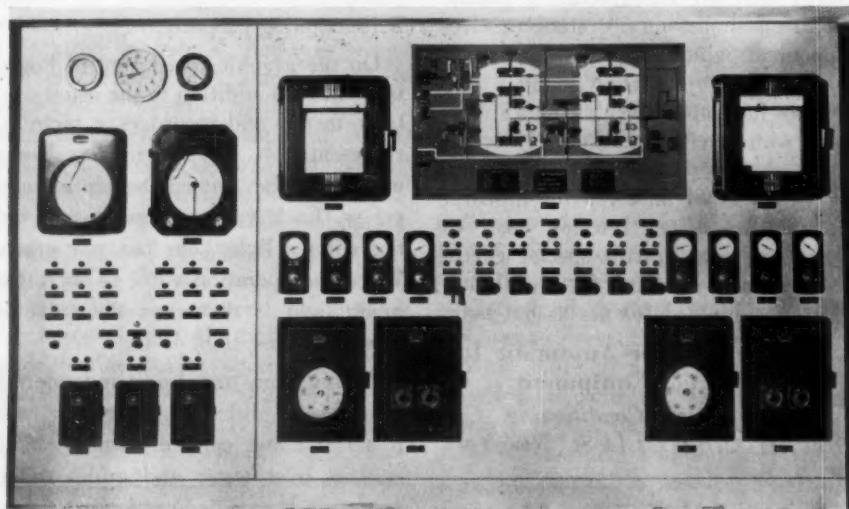


Polishing Room Supplies and Equipment

THE BUCKEYE PRODUCTS CO.

7033 Vine Street · Cincinnati 16, Ohio

Cable address: Buckprod



Panel for automatic ion exchange equipment.

torial arrangement is used to indicate this also.

There is a printed legend on the panel so that the operator can very easily determine if the system is functioning properly and, if not, just where the problem lies.

This system, which is especially advantageous for large demineralization plants, mixed-bed and two-bed demineralizers and hydrogen-sodium blend systems, can be modified to meet individual plant needs.

Tank Magnet

Standard Portable Cord Co., Inc.,
Dept. MF, Jamestown, N. Y.

The Magic Clean-Out Tool, offers quick removal, by magnet, of ferrous metal deposits in dip tanks, plating tanks, acid baths, vapor ovens and heated bake ovens.

The tool is constructed of a guaranteed permanent Neoprene covered Alnico V magnet attached to a 48" wooden handle with die-cast zinc clamps. The clamps are coated with



Hysol 3801-B, the same solution that is used by the plating industry for coating racks and tanks.

The tool is available with 20, 30, or 45 lb. lift magnets.

Ultrasonic Cleaner

Pioneer-Central Division, Bendix Aviation Corporation, Dept MF, Dayton, Ohio.

A new type ultrasonic cleaner for processed parts which saves up to 90 per cent of costs for solvents and more than half the direct labor cost for existing methods of industrial cleaning is going into commercial production.

First deliveries of the new device, to be known as the Bendix Ultrasonic

Cleaner, will be made about Aug. 1. The new unit operates with either water-soluble detergents or cleaning solutions and features the lower-frequency, magnetostrictive transducer—achieving high penetration of ultrasonic energy. The cleaner will be produced in diameters of four, seven-and-a-half and 12 inches — each with a depth equal to its diameter.



The company also announced that a customers' service laboratory has been established at the Davenport plant. Under the direction of *Gilbert Brown*, who is in charge of ultrasonics research, the laboratory will analyze industrial cleaning problems and recommend the most effective solutions.

Electroanalyzer

Eberbach Corporation, Dept. MF, Ann Arbor, Mich.

The new single position electroanalysis apparatus provides multi-position operating efficiency at low cost. Analyses involving stationery electrodes or a rotating anode can be performed. Four elements comprise the analyzer: an electrode holder and cell support, heavy duty support, DC power supply delivering 1.5 amperes and 3-speed stirrer, the latter two operating on 115 volts, 60 cycle AC. With three fixed stirring speeds, 500, 750 and 1,000 r.p.m., through V-belt drive, the stirrer is equipped with a constant-speed, split phase, 1/50 H.P. induction motor by Bodine.

Dry Tumble Finishing Compounds

Tumb-L-Matic, Inc., Dept. MF, 4510 Bullard Ave., New York 70, N. Y.

Tumb-L-Grayn, a new line of media-

compound combinations for producing unusually high luster finishes by dry tumbling methods, has been announced recently.

The result of years of trial and development, the new materials were designed specifically for superior finishing of small metal parts such as jewelry findings, fragile stampings, screw machine parts, wire and other forms made of rolled gold, silver, nickel, chrome, copper, brass and stainless steel.

The new compounds are already in use on a production scale. They are reported easy to use and result in sparkling finishes resembling those obtained on a soft coloring wheel.

The compounds consist of treated

granules, obtainable in various sizes, which separate easily from the parts without dust. The slight residue left on the parts after processing can be wiped or washed off easily. The granules, in turn, can be restored to their original effectiveness by the addition of a special cream.

In most cases the new product can be used without a carrier since the material itself performs that function.

Interested companies can arrange for processing sample lots of parts for evaluation purposes in the New York laboratory of Tumb-L-Matic, Inc. Full size production equipment is used which permits an identical duplication of results in the field.

Sel-Rex Bright Gold Process

has become

THE NEW "GOLD STANDARD"

Here Are The Advantages Sel-Rex Offers To You —

- It requires no scratch brushing or buffing for a mirror-bright finish.
- Its greater throwing power gives more protection with less gold.
- It gives 40% more resistance to wear and abrasion.
- Directly over steel, it gives six times greater protection with 1/4 the amount of gold, in salt spray tests under standard ASTM conditions.
- It is twice as hard as conventional gold plating.
- It does not alter or deform surface contours because of smoothness of deposit.

Sel-Rex Bright Gold solution is easy to maintain, and operates at room temperature. No special equipment is required. Hundreds of successfully operating installations, both decorative and industrial, have proven the superiority of the new Sel-Rex Bright Gold Process.

SEL-REX PRECIOUS METALS, INC.

229 MAIN STREET • BELLEVILLE 9, N. J.

PRECIOUS METALS SALTS AND SOLUTIONS FOR THE PLATING INDUSTRY.

Satisfaction

BUILT THIS NATION-WIDE
REFINING SERVICE



The fabrication of precious metals is our main business. Hence, the recovery of full value from our own scrap and waste is a must with us. That's why we started a refining department more than half a century ago.

In those days we first offered the services of this department to users of gold and silver alloys bought from us. This started a service which to this day has never stopped growing. Now, refining facilities at our plants far outstrip our own needs. Manufacturers by the hundreds from all over the country send us their precious metal scrap and waste regularly.

The reasons they do this? They are satisfied that we do everything possible to reclaim all the value their shipments contain — that our facilities are modern — that our methods are up-to-date — that our returns are consistently accurate.

Yes, satisfied customers have built this important part of our business to its present day size. Would you like to know what this can mean to you? Send us your next shipment. Let our return show why so many ship to us regularly. Send it to our nearest plant listed below.

WEST COAST		CENTRAL U. S.		EAST COAST	
3635 Redford St. Los Angeles 63, Calif.		1900 West Kinzie St. Chicago 22, Ill.		82 Fulton St. New York 36, N. Y.	
				15 West 46th St. New York 36, N. Y.	
				Bridgeport 1 Conn.	
				423 Richmond St. Providence 3, R. I.	

Water-Soluble Rust Inhibitor

Nox-Rust Chemical Corp., Dept. MF,
333 N. Michigan Ave., Chicago 1, Ill.

Rusting of metal during and after water washes or hydrostatic testing has long been an industrial problem. Solution to this problem is a new water-soluble rust inhibitor, the development of which was announced recently. This new chemical, called Rust Inhibitor Q, is a white, crystalline powder which is dissolved in water, so as to make that water non-rusting.

The properties of the new product make it particularly desirable for use in water rinses following cleaning operations on metal. It is also excellent

for addition to water used in hydrostatic testing of such items as pumps, tanks, radiators, etc.

The outstanding feature of this new chemical is that the air-dried parts will then have an invisible film on them giving rust protection between machining or assembly operations.

Concentrated Acid Hose

Republic Rubber Division, Lee Rubber & Tire Corp., Dept. MF, Youngstown 1, Ohio.

It is now possible to safely conduct concentrated acid solutions in rubber hose since exhaustive field and laboratory tests show that a new type of hose tube compound permits fabrica-

tion of both suction and discharge hose in a wide variety of sizes that will conduct concentrated acid solutions without deteriorating effects.

The company announces that the new acid hose has been in field service several months, safely and economically conducting sulphuric acid 66° Baume, 70% hydrofluoric acid, concentrated chromic acid, and concentrated nitric acid.

BUSINESS ITEMS

Hammond Appoints Eastern Representative

William J. Fabish has been appointed Eastern representative for Hammond Machinery Builders, Inc., Kalamazoo, Mich. Mr. Fabish will repre-



William J. Fabish

sent the company for the complete line of machinery. He has been serving the metalworking industry in the East for the past 12 years.

Robert Fay O'Connell Appointed Permutit Sales Engineer

The Industrial Sales Department of The Permutit Co., New York, N. Y. manufacturers of ion exchange resins and water conditioning apparatus, has announced the appointment of Robert Fay O'Connell as sales engineer of its St. Louis, Mo. office.

Mr. O'Connell will assume his new duties on August 1. He started with the company in November, 1953 and prepared for his new position as a sales trainee at the New York offices.

Prior to joining the company he spent seven years with the Phelan Faust Paint Mfg. Co., St. Louis, Mo. as plant engineer and development



Robert Fay O'Connell

chemist and two years with the Firestone Tire & Rubber Co., Akron, Ohio as chief analytical chemist. Sandwiched between these positions, he served three years in the service of the United States Navy in the Submarine Corps.

He attended Washington University, St. Louis, Mo. receiving a Bachelor's degree in Chemical Engineering in 1941, and is a member of the U. S. Naval Reserve and the American Chemical Society.

Burton G. Adams Named Sales Representative for Pennsalt Chemical Specialties Division

Burton G. Adams has been appointed sales representative in Southern California for the Chemical Specialties Division of the *Pennsylvania Salt Mfg. Co.* Announcement of his appointment was made by *Joseph J. Duffy*, Metal Processing Department manager.

Mr. Adams will be responsible for



Burton G. Adams

the full line of Pennsalt cleaning and metal surface preparations, and will be available for service to metal finishing companies throughout the Southern California area.

He will have his headquarters at 4820 Loma Vista Ave., Los Angeles and will work under the supervision of *Richard A. Snyder*, a well-known figure to the California metal working industry. A native of California, Mr. Adams was recently graduated from the University of California. He will reside in Whittier with his wife, Gae, and daughter, Linda

P. A. Finn to Service Industrial Users of Wyandotte Chemicals

Paul A. Finn recently joined the industrial sales and service staff of

Wyandotte Chemicals, manufacturers of specialized cleaners for the petroleum and metal processing industries. Mr. Finn will work from company's Dallas office, will headquarter in Houston and will specialize in petroleum maintenance service.

At one time connected with an aviation company on Long Island, Mr. Finn for 7 years was in charge of a chemical laboratory serving the petroleum and metal processing industries. He was recently southwest regional sales manager for a chemical research firm serving the industrial cleaning industry.

Mr. Finn is a member of the American Petroleum Institute, American Electroplaters' Society, Society of Automotive Engineers and the Amer-

EXTRA TOUGH and FLEXIBLE NEW!

DECORATIVE ALUMINUM COATING

SPEKALUMINITE®

No. 316

ONE COAT Applied Directly on Cold Rolled Steel
GIVES MORE THAN

300 HOURS SALT SPRAY RESISTANCE

SPEKALUMINITE No. 316 is specially formulated to meet the most exacting specifications. In addition to greater beauty, it has the greatest resistance of ALL Aluminum Organic Finishes • Brighter • Harder • Will Not Peel or Flake • Rust and Tarnish Resistant • (Over 300 HOURS Salt Spray Test). Produces A Beautiful Cadmium-Bright Finish. Self Priming. Adheres Perfectly to All Metals and Plastics • Looks Better • Lasts Longer • Costs Less.

Write for FREE Sample and
Bulletin MF 9.

- No Primer Required
- Air Dries Dust Free in 15 minutes
- Remains Flexible at a Temperature of 1000°F.
- Over 300 Hours Salt Spray Resistance
- Easy to Apply
- Dip or Spray . . . and Bake!
- No Expensive Equipment Required

SPEKALUMINITE CO.

100 SOUTH WATER STREET

OSSINING, N. Y.

Do you know the TECHNIC METHOD of Electroplating RHODIUM?



Heavy rhodium electroplating—in thicknesses up to .001"—is now entirely practicable. Using Technic solutions and controlled equipment, you can impart the properties of pure rhodium to base metals. Our method suggests applications throughout industry to solve problems that have long baffled design engineers.

Recommended Applications

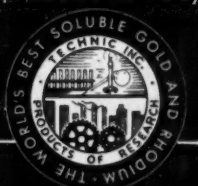
—include use of rhodium wherever extremely corrosive conditions are encountered. Very hard and resistant to wear, rhodium remains tarnish-free in all atmospheres, is unaffected by acids, alkalis or salts. If you are now plating rhodium, we can equip you to do better work at lower cost—if you have not yet taken advantage of rhodium's unique qualities, we can equip you to do low-cost electroplating with scientifically controlled results.

Without obligation, send us your problems for study

TECHNIC INC.

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JAckson 1-4200



THE LARGEST ENTERPRISE OF ITS KIND IN THE WORLD



Paul A. Finn

ican Society of Mechanical Engineers.

Pennsalt to Build Two New Plants

To provide better customer service for expanding markets for special chemicals, the *Pennsylvania Salt Mfg. Co.* will add two new plants, according to *George B. Beitzel*, president of the consolidated company. Both plants will serve as major components of the *Chemical Specialties Division* which is headed by *Albert H. Clem*, division president.

New Plants will be constructed at Delaware, O. and at Chicago Heights, Ill. The new buildings will be modern, one-story brick structures. These plants will serve as primary regional blending, packaging, warehousing and dis-

tribution centers. The products they will handle include: cleansing and sanitizing agents for the food industries, farm and home; laundry and dry cleaning chemicals; metal cleaners, coatings and special lubricants for the metal industries; and maintenance chemicals. *Lewis Lye*, Pennsalt's oldest product, will be among the products packaged at the Chicago Heights plant.

Construction is expected to be completed this year.

Formax Appoints Weaver Engineering as Southwest Distributor

Edward W. McAleer, vice-president of *Formax Mfg. Corp.*, Detroit manufacturer of buffing wheels and buffing compounds, announced the appointment of *Weaver Engineering and Supply Co., Inc.*, Grand Prairie, Tex. as their distributor. A complete factory stock of Formax buffing compounds and Zippo buffing wheels will be warehoused at this location. The president of Weaver Engineering, *James E. Weaver*, has a well-rounded background of experience in the metal finishing field. In past years, he had been associated with National Cash Register Co. in their plating laboratory and served as assistant superintendent of the Metal Division, Hickok Mfg. Co., Rochester, N. Y. He established a plating supply business at Houston, Tex., four years ago and, while a warehouse is now maintained there, his main operation was moved to Grand Prairie in 1953 with the acquisition of a larger office and warehouse facilities.

Detrex Names New West Central Region Manager

Paul W. Moehle has been appointed



Paul W. Moehle

West Central Region manager for the *Detrex Corporation* of Detroit, major producers of metal-cleaning machinery and chemicals, announced *W. F. Newberry*, director of sales.

A member of the organization for 16 years, Moehle began in the purchasing department, then became a field sales representative, and for the past three years served as national accounts manager.

He will continue to serve as national accounts manager in addition to his new duties.

A native of Washington, D. C., Moehle is a member of the Electroplaters' Society of Detroit.

Electro Refractories & Abrasive Corp. Appoints Rush

James Rush, formerly of Massillon, Ohio, has joined the sales force of *Electro Refractories & Abrasives Corp.*, of Buffalo, N. Y., and will be grinding wheel representative in the Indianapolis territory. He attended Wittenberg College in Ohio and spent two years in the U. S. Navy.

John P Termini Joins Permutit

The Permutit Company, New York, N. Y., manufacturers of ion exchange resins and water conditioning apparatus, has announced the addition of *John P. Termini* to its Special Applications Department.

Mr. Termini, appointed to the position of research engineer, has been assigned to work on the design and application of ion exchange techniques and materials outside of the field of water treatment. Prior to joining the company he was employed by the United States Atomic Energy Commission in the Process Development



John P. Termini

Branch, Production Division, New York Operations office and with National Starch Products, Inc.

He attended Columbia University, New York, N. Y., receiving a Bachelor's degree in Chemical Engineering in 1949 and is a member of the American Chemical Society.

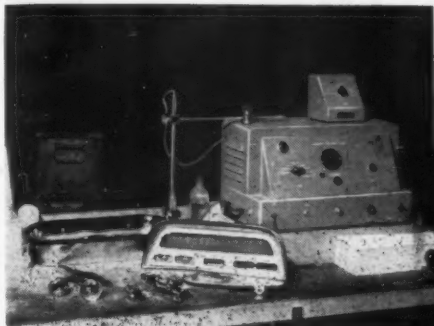
Spratt Joins Oakite in Los Angeles Area

Jerome E. Spratt is the most recent addition to the Los Angeles staff of *Oakite Products, Inc.*, manufacturers of industrial cleaning and metal treating materials. For the past fourteen years, Mr. Spratt has been with the Mission Appliance Corp. in Hawthorne, where he was manager of the finishing



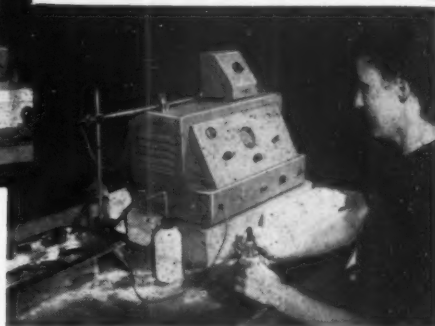
Jerome E. Spratt

KING-SEELEY CORPORATION, ANN ARBOR, MICHIGAN solves thickness testing problem with KOCOUR ELECTRONIC THICKNESS TESTER



ABOVE: King-Seeley Corp., manufacturer of automotive gauges, governors, interval timers and electrical appliances, conveniently located the Electronic Thickness Tester in production department.

BELOW: To conform to specifications, operator can check work quickly, as it progresses. This is a regular production control operation at King-Seeley Corp.



About 2 years ago the King-Seeley Corp. purchased the Kocour Electronic Thickness Tester . . . evaluated the instrument and have been using it since with confidence and satisfaction. Mr. C. F. Waite of that company wrote a paper, "Thickness of Electrodeposited Coatings by the Anodic Solution Method" concerning their problems and how they were solved.

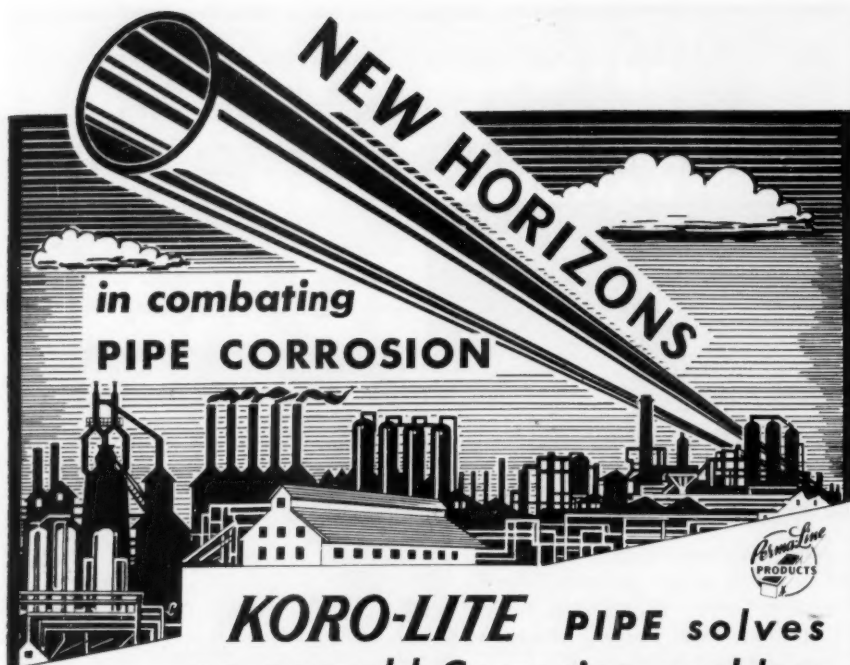
King-Seeley Corp. is one of the many companies which are now saving hours of control and production time with the Electronic Thickness Tester. In addition, more efficient operation and higher standards of quality can be maintained confidently.

Why not investigate the possibilities today. See how the Kocour Electronic Thickness Tester can solve your problems. Write for literature and get your copy of "Thickness of Electrodeposited Coatings by the Anodic Solution Method."

KOCOUR COMPANY

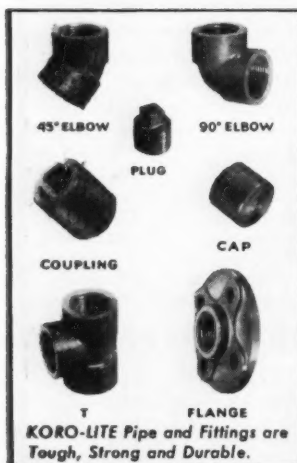
4802 S. ST. LOUIS AVE.,
CHICAGO 32, ILLINOIS

Always specify KOCOUR TEST SETS from your supplier!



KORO-LITE PIPE solves an age-old Corrosion problem

• A New NON-PLASTICIZED POLYVINYL CHLORIDE Product



KORO-LITE—rigid HIGH IMPACT pipe opens up new horizons in man's struggle against corrosion. This new P.V.C. development embodies corrosion-resistant qualities with ruggedness of metal and high impact strength. KORO-LITE—rigid HIGH IMPACT pipe not only solves corrosion problems, but offers toughness, tensile strength of aluminum with $\frac{1}{2}$ its weight, high impact qualities, excellent abrasive resistance, low coefficient of expansion, high insulation value, and will not support combustion.

EASY TO INSTALL: Clean tapered threading accomplished with ordinary dies without lubricants. Held to I.P.S. strong dimensions, easily connected to existing metal pipes. Under proper heat and mechanical work can be offset, bent and welded.

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department, among others. A resident of Downey, he will serve the metal working industries in East Los Angeles, Alhambra, Glendale, and South Pasadena. Mr. Spratt recently completed an intensive eight-week training course at the company's New York research and engineering laboratories and in the field.

Robert W. Clarke Named Manager of Pennsalt's Delaware, Ohio Plant

Robert W. Clarke has been named manager of the new Pennsylvania Salt Mfg. Co.'s plant at Delaware, Ohio. Announcement of his appointment was made recently by Albert H. Clem, president of the Chemical Specialties Division, under which the new plant will operate.

Mr. Clarke, a native of Portland, Ore. has had a wide variety of experience in Pennsalt's engineering and manufacturing departments at several of the company's plants. Previous to his appointment as manager of the Delaware, Ohio plant, for which ground was broken on June 17, he was supervisor of production controls for the Industrial Chemicals Division with offices in Philadelphia.

Following receipt of his Bachelor of Science degree in Chemical Engineering from Oregon State College in 1944, he began work at the Portland plant. For a short time before transferring to the Wyandotte, Mich. works in October, 1946, he also worked in the engineering department of the Tacoma, Wash. plant.

At Wyandotte Mr. Clarke served as assistant to the superintendent of engineering and later as process engineer.

In February, 1948 he was transferred to the Natrona, Pa. plant where, as production supervisor, he supervised the start-up of the benzene hexachloride plant and later served as supervisor of the DDT plant. He was transferred to the Philadelphia Office in March, 1952.

Mr. Clarke, his wife, Dorothy, and daughters Gale, 8 and Patricia, 4, currently make their home in Drexel Hill, a suburb of Philadelphia. They will move to Delaware, Ohio prior to September 1. Mr. Clarke will assist in supervising construction of the new plant and installation of its blending equipment, both of which are scheduled for completion by the end of this year.

He is a member of the American Chemical Society and the American Institute of Chemical Engineers.

Promotions in Apothecaries Hall Company

The management of *Apothecaries Hall Co.* announced on June 2nd the promotion of *Frederick S. Foster* to the position of manager, Industrial Chemicals Department.

Mr. Foster is a graduate of DePauw University, Greencastle, Indiana, class of 1932, where he majored in chemistry. He received a B.A. degree and was elected to Phi Beta Kappa. He took one year post graduate work at Colgate University. He has been associated with the company since 1934. He worked in the company's analytical and research laboratory for seven years and was in charge of allocations and priorities for three years. For



Frederick S. Foster



Theodore Z. Voyda

seven years Mr. Foster was in the sales department, and from 1948 to 1951 served in the capacity of sales engineer.

Since July 1951 Mr. Foster has been assistant to the vice-president. In his new position he will be in charge of all phases of the company's operations involving industrial chemicals. He will report directly to the president.

Theodore Z. Voyda, chief chemist since 1946 has been named technical director effective June 2nd, reporting to the president. Mr. Voyda is a University of Connecticut graduate where he received a B.S. Degree in 1939 and M.S. Degree in 1944.

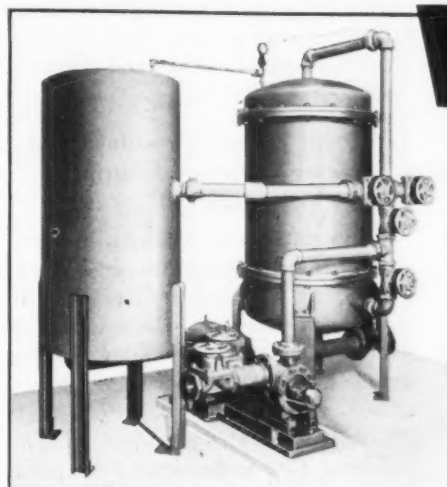
Mr. Voyda has been engaged in metal finishing activities for the past fourteen years and was formerly supervisor of electrochemical research and development at Pratt and Whitney Aircraft in East Hartford. He is a member of the American Electroplaters' Society, the Electrochemical Society, the American Chemical Society and Sigma Xi, honorary scientific society.

In his new capacity, Mr. Voyda will be in charge of the product development and research groups, as well as the technical service section, relating to company's metal finishing and detergent lines.

Germany to Share Latest Clad Metals Developments with Knapp Mills, Inc., of New York

After a year of intensive technical investigation, Aug. Schnackenberg & Co., Germany's leading producer of lead chemical equipment, and Knapp Mills, Inc., of New York, world's largest producer of Ferrolum lead clad steel and Cupralum lead clad

WAGNER BROTHERS FILTERS OFFER



DOUBLE ECONOMY

LOW OPERATING COST LOW MAINTENANCE COST

Consider two factors before you specify filtering equipment:

- 1 The gallons of solution which can be efficiently filtered in a given period of time.
- 2 The cost of maintaining the filtering mechanism.

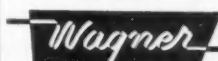
It's an established fact that Wagner Brothers Filters have a higher effective flow rate than any other equipment with equal filtration area . . . thus, gallon for gallon, it delivers more pure filtrate per hour at a lower unit cost. Sludge and other impurities (down to 1/10 micron) injurious to your plating quality are removed when the bath or solution is pumped through permanent membranes caked with a few cents worth of filter-aid (diatomaceous earth).

To clean, you simply turn a few valves and reverse the flow. Air bump backwash shocks the caked filter-aid from the membranes and through the sludge drain. Maintenance costs are reduced to 1/2 that of ordinary industrial filters since there is no messy replacement of bags, sheets or pads, no manual cleaning labor, no dismantling.

Standard models are available in capacities from 560 GPH up, filter areas from 3 to 100 square feet.

We design and build specials to suit your requirements. Write for detailed information and filtering questionnaire. If you're a plating equipment distributor, ask about territories open.

Your primary source for plating and polishing equipment and supplies.



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copper, recently concluded an 18 year license agreement whereby the German firm employs Knapp's patented processes and know-how for the production of lead clad metals in Germany.

Included in the contract are four commercial processes not previously disclosed, one of which according to Alfred P. Knapp, president of Knapp Mills, may also be significant in the production of lead pipe and other forms of lead previously extruded under thousand-ton pressures. Another basic process included in the agreement with the German firm is the automatic lead cladding machine originally invented by the American Viscose Corp., now being commercially developed by Knapp Mills.

Kosmos Moves to Belleville, N. J.

John C. Kosmos has moved from Springfield, Mass. to Belleville, N. J., where he will head Kosmos Electro-Finishing Research, Inc., at 13 Valley St. He will be the chemist and manager of the company, which will conduct research in supplementary conversion coatings for such metals as zinc, cadmium, aluminum, tin, copper, and their alloys. He will also conduct customer service as plating consultant in industrial electroplating and finishing. He is a member of the American Electroplaters' Society, The Electrochemical Society, and the American Chemical Society. He attended the City College of New York, The University



John C. Kosmos

of Connecticut, and received his B.S. from Trinity College, Hartford, Conn. His qualifications include: production and laboratory in materials control at Pratt & Whitney Aircraft from 1941-1945, process control chemist from 1946-1949 at Underwood Corp., and as research and technical service chemist at The Chemical Corp. from 1949-1954.

The new company headed by Kos-

mos will distribute all kinds of plating and finishing equipment, plating room chemicals and processes. Other officers for the company are: *Peter G. Ellis* from Springfield, Mass., and *Evans C. Sperry*, New York City.

T. R. Gill Elected President and a Director of General Supply and G. S. Equipment

Highlighting a major expansion program at *The General Supply Co.* and *The G. S. Equipment Co.*, 5317 St. Clair Ave., Cleveland, Ohio, is the recent election of *T. R. "Tom" Gill* as president and a member of the board at both firms.

Gill is also vice-president of *The Singleton Co.*, manufacturer of metal finishing equipment located at the same address. He is general manager and a director for all three corporations.

General Supply is distributor for an extensive line of materials and supplies for metal finishing. *G. S. Equipment* serves the field with equipment of its own design and manufacture, as well as *Singleton* and other national makes.

Expansion plans affecting these com-



T. R. Gill

panies include a new Cleveland plant-building program, introduction of several new product developments and board extension of national distribution facilities coast-to-coast. Complete details will be announced soon.

"Tom" Gill is widely known in the chemical processing and metal finishing fields. He is a graduate chemical engineer from Michigan State, a Registered Professional Engineer and a

BRIGHTER Barrel Nickel Plating with TRUE BRITE NICKEL BRIGHTENER

Increase Production

easy to control . . . cuts down on trouble that entails costly delays.

Save time

can be operated at a higher speed.

Reduce Rejects

gives unbelievable uniformity of deposit in recesses . . . brighter, white color.

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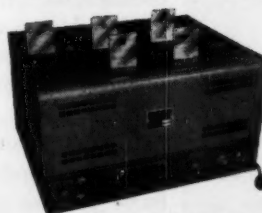
We maintain a customer laboratory for the testing of your solutions. Our free services will save you money. Why not find out for yourself. Write to—

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past officer in the Cleveland Chapter of *American Electroplaters' Society*. He began his career at Udylyte in Detroit and New York, moved to Lasalco, St. Louis; later McGean Chemical, Cleveland, and finally Van der Horst, prior to joining General Supply in 1947 as sales manager. Hobbies are golf and fishing.

A family-man, Gill resides with his wife and children in Shaker Heights, Ohio, part of Greater Cleveland.

Pennsalt Chemicals Announces Establishment of Canadian Division

Albert H. Clem, president of the Chemical Specialties Division of the *Pennsylvania Salt Mfg. Co.*, has announced the establishment of *Pennsalt Chemicals of Canada*.

Under an agreement with *Canadian Industries, Ltd.*, who for the past 15 years have handled Pennsalt metal cleaners sales in Canada, this new component of the 104-year-old, multi-plant Philadelphia company will serve its growing Canadian markets through new sales office and warehouse facilities in Hamilton, Ontario.

William B. Billingsley, formerly of CIL and well known in Canadian metal finishing circles for more than 20 years, has been named manager of the new division.

Whitfield Chemical Appoints Borst

The appointment of Ray F. Borst as a sales and service representative for the *Whitfield Chemical Co.*, Detroit, Mich. has been announced by C. Whitfield Smith, president. His territory includes parts of Illinois, Wis-



Ray F. Borst

consin and Indiana, with headquarters in Chicago.

A native of Illinois, Borst has been active in industrial engineering for the past several years and was formerly associated with Bryant Heater Co.

Geigy Announces Retirement of Mark Weisberg

Geigy Chemical Corp. announced today the retirement of Mark Weisberg, formerly in charge of its *Alrose Chemical Co. Division* in Cranston, R. I. Mr. Weisberg founded Alrose in 1935. After its acquisition by Geigy in 1949 he continued as its president until it became a division of Geigy on March 30 of this year.

During his association with Alrose



Mark Weisberg

GIVE YOUR PRODUCTS A BRILLIANT FUTURE

Plate with **HUSSEY**
PURE
COPPER ANODES

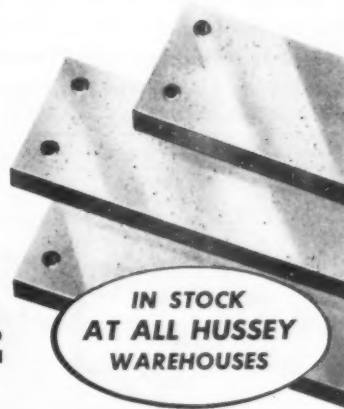
- PURE, UNIFORM COPPER
- FULL RANGE OF SIZES & SHAPES
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HUSSEY

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ROLLING MILLS AND GENERAL OFFICES,
PITTSBURGH 19, PA.

7 Convenient Warehouses to serve you promptly!
PITTSBURGH • CLEVELAND • NEW YORK • CHICAGO
ST. LOUIS • PHILADELPHIA • CINCINNATI



he was largely responsible for the development of many new products of significance to both the chemical and non-chemical industry.

Barker Bros. Appoints Canadian Distributor

Barker Bros., Inc., 1664 Summerfield St., Brooklyn 27, N. Y., announces that their exclusive Canadian distributor will be *The Lea Products Co.*, 996 DeBullion St., Montreal, Canada.

Lea Products has handled some of the Barker line in the past. They will now be the exclusive distributor of all Canadian sales of Barker buffs. Lea Products also manufactures a line of polishing compositions.

Miller-Walgren Elected Directors of H-VW-M

Hanson-Van Winkle-Munning Company, Matawan, N. J., announces the election of *J. C. Miller* and *G. H. Walgren* to its board of directors.

Miller, until his organization became a division of H-VW-M, was chairman of the board of the *J. C. Miller Co.*, Grand Rapids, Mich., which he founded in 1920. Walgren, who has



J. C. Miller

been with J. C. Miller for more than 18 years, was president of this company.

Walgren has been appointed vice-president of H-VW-M and has been placed in charge of J. C. Miller Division. The facilities and policies which have accounted for the success of the J. C. Miller Company will be continued.

Other appointments to the manage-



G. H. Walgren

ment team of the Miller Division include *J. A. Badalucco* as assistant general manager; *F. W. May* as manager of sales; and *C. E. Jackson* as purchasing agent. All of these men were with Miller in similar capacities for many years.

New Sales Engineers at Metalweld

According to a recent announcement by *S. John Oechsle, Jr.*, general manager of the Scotts Lane plant, two new

★ **BUFFING NU SPRA GLU**
Liquid buffing compound
since 1945

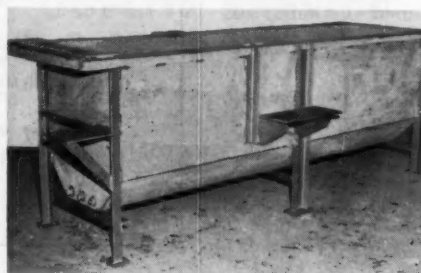
★ **NUGLU**
Cold flexible glue
since 1937

★ **BRUSHING NUGLU**
Grain and Nuglu mixture
since 1941

★ **SPRAY BUFFING EQUIPMENT**
Guns, pumps, and valves
since 1945

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Add years to the life of your processing tanks

Tanks rarely wear out. They often rust out. Therefore, select a construction material that will offer maximum resistance to your corrosion conditions. Then specify Stortswelded fabrication, which develops the full strength of the construction metal in every welded seam, and holds back corrosion on a smooth unbroken front, free from cracks, crevices and pockets. We shall be glad to advise and to quote on your current requirements.

STORTS
WELDING COMPANY
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Manufacturers of Welded Fabrications to Specification

38 Stone Street
MERIDEN, CONN.



Kenneth G. LeFevre

sales engineers have just been appointed to the staff of the Protective Coatings Division of *Metalweld, Inc.*, Philadelphia.

They are *Kenneth G. LeFevre*, a graduate of the University of Pennsylvania, who was formerly connected with a chemical firm in the Chicago area, and *Joseph H. Briscoe*, who studied engineering at the University of Tulsa and was also on the staff of a chemical organization.



Joseph H. Briscoe

Both these men will handle the sale of synthetic coatings, rubber linings, metallizing, and specification coatings in the New England, Eastern and Southern territory serviced by the company.

Free Course in Electroplating

The course of study in Electroplating given at the *Brooklyn Evening-Technical High School*, 29 Fort Greene Place, Brooklyn, N. Y. will begin its Fall term session on September 15,

1954. Classroom discussion and laboratory experiments, relating to electroplating, divide the time for the course. Classroom topics include simple calculations for tank capacities, tank formulas, reading of graphs and the meaning of Baume scale measurements. To better understand the operation of the tank a review of the fundamentals of elementary chemistry and series and parallel circuits are discussed. Additional topics include brighteners, pH, wetting agents, buffer agents, pitting and deionizing. In the laboratory individual experiments on samples of plating solutions are carried out. Methods of analyses for copper, nickel, chromium and silver baths are performed by the members of the class; additional laboratory work covers Hull Cell studies, pH meter operation, anodizing, plating on plastics, thickness measurements.

Registration begins September 13, 1954 and daily thereafter from 7:00 to 9:00 P.M. Classes meet on Tuesday and Thursday from 6:45 to 8:15 P.M. plus about six (6) Friday evenings for the term. The term begins September 15, 1954 and ends January 28, 1955. Ask for Mr. L. Serota in Room BW17 or 3E10.

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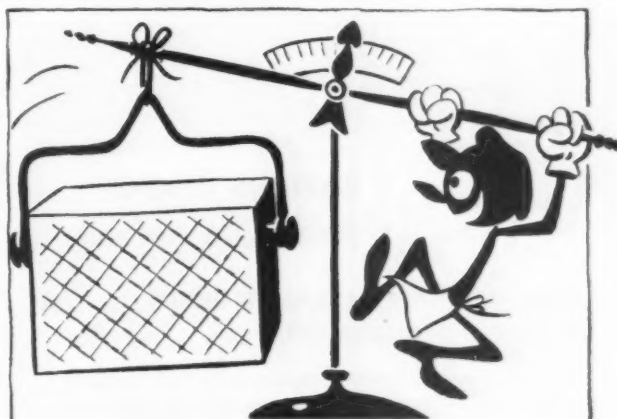
**TAILOR-MADE
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Aluminum, Brass, Copper, Stainless Steel, Carbon Steel, etc.

CAKE, DIP AND SPRAY

CEMENT AND THINNER
for setting up wheels, belts and rolls.

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Sure as fate
Picks Monel
For lighter weight**

What makes Monel lighter? High strength (thin sections handle big loads) plus Monel's acid resistance (less corrosion allowance). Easy-to-repair Monel gives long life, too. Free booklet, "5-Way Savings in Pickling," is worth writing for today.

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extra life
extra capacity
extra safety



Monel Pickling Equipment

Detrex Opens New England Office

The *Detrex Corporation* of Detroit, manufacturers of chemicals and industrial metal-cleaning equipment, has established a New England regional office in Meriden, Conn., *W. F. Newbery*, director of sales, has announced.

Headed by *A. D. Chabot*, New England region manager, the new office will serve Vermont, Maine, New Hampshire, Massachusetts, Connecticut and Rhode Island.

A veteran of the metal-cleaning field for 18 years, Chabot is a graduate of the University of Connecticut where he received his B.S. degree in mechanical engineering.

The new office is located at 35 Colony St. in Meriden.

Wiretex Mfg. Co. Appoints New Representatives

Wiretex Manufacturing Co., 40 Mason St., Fairfield, Conn., manufacturers of all kinds of wire mesh baskets, screens, racks, etc., has appointed *Troutman Associates* P. O. Box 613, Louisville, Ky., as their sales representatives to cover Indiana, Kentucky,

Tennessee, Southwestern Ohio and certain counties in Illinois.

Also appointed is the *H. W. Paret Co.*, for the territory of Western Pennsylvania and Eastern Ohio. Their main office is in Sewickley, Pa., with a post office address of P. O. Box 16.

Dr. Harry Walker Forms Rectifier Division

Dr. Harry Walker, formerly with Wesley Block Company, has launched the *Walker Division* of the *Norma Hoffman Bearings Corp.*, Hamilton Ave., Stamford, Conn. to manufacture selenium rectifiers for the plating industry.

Solventol Has Licensed Foreign Manufacturer

Howard B. Downs, vice-president and general manager of *Solventol Chemical Products, Inc.* announces that the *Electro Chemical Engineering Co., Ltd.* Weybridge, Surrey, England has been licensed to manufacture di-phase cleaners and cleaning equipment under the Solventol patents. They will have exclusive sales rights for the cleaners and cleaning equipment in

the British Empire and all Continental Europe outside the Iron Curtain.

James Eric Entwistle, of the English firm, has been in the United States for several months studying the operation. Mr. Entwistle, a Chemical Engineer, has been an executive of the *Electro Chemical Engineering Co.* for several years. He will return to England early in July and expects that his company's plant at Weybridge will be in production on these products by the middle of August.

Schultz Heads National Metal Finishing

Frank J. Schultz has been named president of *National Metal Finishing Co., Inc.*, succeeding *John M. Johnston*, who resigned. The firm does decorative and industrial type plating.

Other officers elected were *Mrs. Augusta Schulz*, treasurer, and *Mrs. Rosalyn E. Label*, clerk.

Eisenman Nominated for 19th Consecutive Two-Year Term as ASM National Secretary

W. H. Eisenman, national secretary for the past thirty-six years, has been



LEA GRIPMASTER

Industry's Abrasive

BONDING CEMENT
for Wheels and Belts


MEETS TOUGHEST ABRASIVE GRAIN BONDING REQUIREMENTS

The purpose of a bonding cement is to hold abrasive grains firmly in position. It's as simple as that—and when we claim that GRIPMASTER will hold grains better than conventional cements, we mean it. But to convince yourself, why not place a small trial order—for a 75 pound pail or the packaged unit (4 one gallon cans).

Our distributor nearest to you has GRIPMASTER in stock and when we ship your trial order we'll let you know where you can reach him. Or, if you prefer to obtain the trial order through him, write or phone us and we'll let you know where he is located.

LEA-MICHIGAN, INC.
14066 Stansbury Ave., Detroit 27, Michigan

The Lea Mfg. Co., Waterbury 20, Conn.
Lea Mfg. Co. of Canada, Toronto
Lea-Ronal, Inc., Long Island City 1, N. Y.



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IS YOUR ELECTRICAL SYSTEM EFFICIENT?
We have recommended new equipment to many manufacturers that has paid for itself in a matter of months. Why not let us check your power set-up? Write to—

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DETROIT 11, MICHIGAN

SPEED-UP
your nickel stripping
PROTECT
the base metal

with **STRIPODE**

A proved addition agent, STRIPODE strips nickel plate faster and protects the base metal from pitting, roughening and etching. Also saves on use of acid, eliminates need of sand blasting or heavy buffing operation. Try it!

ORDER A TRIAL GALLON!

THE CHEMICAL CORPORATION
54 Waltham Avenue
SPRINGFIELD • MASSACHUSETTS

nominated to succeed himself for the 19th consecutive two-year term.

In 1918, when he assumed executive management of the Society, it was a modest group, around 200 members, with high purposes and plenty of determination. Today, the original 200 ASM membership has grown to a membership of nearly 24,000 in 87 chapters throughout the U. S. and Canada.

J. E. Austin, ASM national president, was chairman of the nominating committee. Committee membership included Past Presidents *Ralph L. Wilson, John Chipman, Walter E. Jominy, Arthur E. Focke, Harold K. Work* and *Francis B. Foley*.

Copper and Brass Warehousemen form New, Free, Service Which Enables Customers to get Hard-to-get Products Anywhere in the United States

A new, free service for customers of copper and brass warehousemen, who buy literally tens of thousands of different shapes and sizes and alloys of copper base products, is expected to ease many bottlenecks, cut lead time on production schedules and all with-

out the payment of any premium in the price of the item, according to *George Proffitt*, executive secretary of the *Copper and Brass Warehouse Assn., Inc.*

Members of the association, will pool their information on hard-to-get items and if the item exists anywhere in the U. S., a user should be able to get it in little more than a week.

Here's how the new service works: Suppose a contractor in one city wishes to get a particular shape and alloy that his local warehouseman can't supply. The warehouseman will call or wire association headquarters. The product will then be listed in the association bulletin and any member who has such a product will be asked to wire the member warehouseman who needs it. In critical examples, where speed is of the essence, the product can be sent by air express. If time is less pressing, it will be shipped in the regular way.

Since virtually all copper and brass warehousemen in the country are members of the association, the practical effect of the arrangement will be to make products they handle, anywhere

in the U. S. immediately available to any customer. Under the new arrangement, every local warehouseman has at his disposal the entire stock of virtually every other warehouseman in the country. The association hopes that the new service will help customers avoid costly delays in locating hard-to-find items.

Wegenhart New Chemical Corp. Representative

M. A. Wegenhart has been appointed as a representative for *The Chemical Corporation*, manufacturers of chemical resistant reinforced plastic material for the electroplating and chemical processing industries.

Mr. Wegenhart, who resides at 7792 Rita Lane, Madira, Ohio, will cover the states of Ohio, Indiana, Michigan and Kentucky.

Chandeysson Electric Co. Appoints Embree

Robert A. Embree has been appointed process and plant engineer of the motor-generator division of *Chandeysson Electric Co.* in St. Louis. Although Mr. Embree graduated from

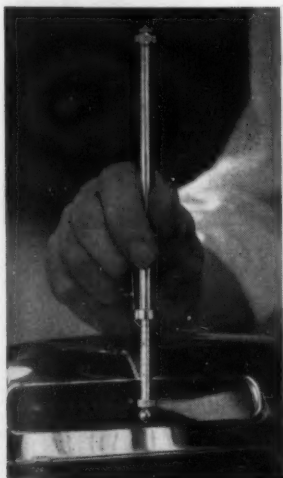


A magnetic thickness tester ...

POCKET HANDI-GAGE

FOR ELECTRODEPOSITED, HOT DIPPED OR PAINTED COATINGS ON STEEL

Tests thicknesses from 0.0001 to 0.015 inch. Each individual gage is separately calibrated to National Bureau of Standards thickness plates, resulting in an accuracy to 10% for thicknesses over 0.0002 inch. As simple to use as an automobile tire gage, the Pocket Handi-Gage may be used on the production line or in the lab. It's perfect as a "Go, No-Go" thickness gage at the plating tank or spray booth.

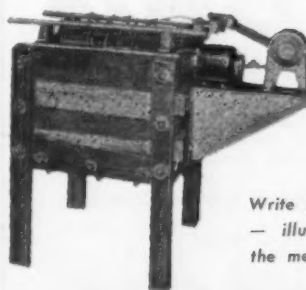


NO BIGGER THAN A FOUNTAIN PEN, BUT WHAT A JOB IT DOES!

Tests brass, cadmium, copper, lead, nickel, silver, tin, zinc, lead-tin and zinc-tin alloys, hot dipped tin and zinc, paint, plastic laminations, enamel and lacquer on steel and other magnetic metals. Gives results in SECONDS. Especially adapted for hard-to-reach areas. Comes in a pocket-sized case complete with magnets for various thickness ranges.



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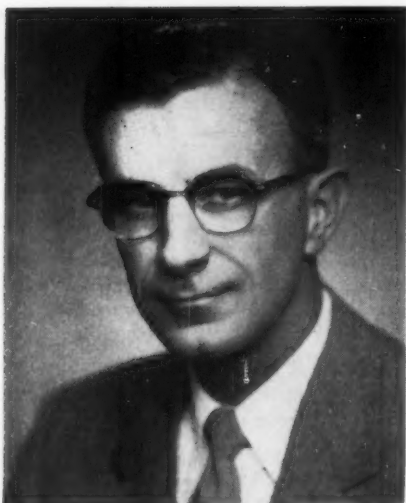
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Motor Driven Tank Rod Agitators. Single or Double arms.

Write for NEW 1954 Holland Catalog
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the metal finishing industry.

J. HOLLAND & SONS, INC.

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Robert A. Embree

Iowa State College as an electrical engineer, he followed his chosen profession but a few years. Thereafter, he specialized in methods and process engineering, as well as industrial management. During the past 16 years, he held several management positions with Laclede Christy, his most recent having been plant manager.

In his new capacity, Mr. Embree

will have charge of all manufacturing methods, processes, equipment and facilities.

Manufacturers' Literature

Plating Equipment

U. S. Galvanizing & Plating Equipment Corp., Dept. MF, 27 Heyward St., Brooklyn 11, N. Y.

A 16-page booklet describes barrel and conveyorized rack plating equipment produced by the above manufacturer. Numerous photographs show typical installations of all kinds of automatic and semi-automatic machines for cleaning, pickling, plating and drying.

Copies of this booklet are available by writing to the manufacturer at the above address.

Permanent Membrane Filters

Filter Division, Wagner Brothers, Inc., Dept. MF, 400 Midland Ave., Detroit 3, Mich.

A new four-page illustrated folder,

describing the company's line of permanent membrane type liquid filters, is now available upon request to the manufacturer. The literature explains precoating, filtering and cleaning operations, with schematic drawings showing flow directions during each of these phases.

The folder, F10-54, tells how efficient, low cost clarification of solutions is made by filtering acid, alkaline or neutral liquids through a series of permanent membranes (wire well screen, porous stone or porous carbon) caked with diatomaceous earth, to remove all suspended particles down to 1/10 micron.

Electric Equipment for Process Industries

General Electric Co., Dept. MF, Schenectady 5, N. Y.

A new bulletin, Electric Equipment For Process Industries, has been announced as available.

Designated, GED-1966A, the 28-page publication provides detailed information on: G-E electrical equipment for power generation; power distribution and conversion; power utili-

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zation; instrumentation; descriptive publications; and G-E service shops and warehouses, applicable to the process industries.

Stress Measuring Instrument

Joseph B. Kushner *Electroplating School, Dept. MF, 115 Broad St., Stroudsburg, Pa.*

Recently made available is a 5 page resume of a talk "A New Instrument for Measuring Stress in Electrodeposits" delivered at the recent convention of the *American Electroplaters' Society*. The talk describes the Stresometer, which measures accurately the stresses produced by shrinkage or expansion of the deposited films.

Rectifier Bulletin

Crown Chemical and Engineering Co., Dept. MF, 4722 Worth St., Los Angeles 63, Cal.

The above manufacturer has recently published a new bulletin No. 554, describing in considerable detail the various types of rectifiers manufactured by the firm, as well as applications for each particular type. These

include 5 general categories as follow:

- (1) The basic rectifier
- (2) The self-contained tap switch rectifier
- (3) The remote-controlled tap switch rectifier
- (4) The magnetic amplifier regulated rectifier
- (5) The magnetic amplifier rectifier with automatic programming and current limiting.

Buff Selector Wall Chart

American Buff Co., Dept. MF, 2414 South La Salle St., Chicago 16, Ill.

Buffing shop foremen and operators can now save time and eliminate guesswork in finding the right buff, the right size, and the right speed for every buffing job with the new large-size Buffing Calculator and Buff Selector Wall Chart now available free of charge.

Lithographed in bright red and black, the big 17" by 22" chart instantly provides such valuable information as: the proper surface speed, spindle speed, and buff diameter for practically any buffing job; plus the recommended type of buff for both

cutting and coloring operations on various metals and surfaces.

The information on the chart is conveniently arranged for quick reference, and is printed in large type, easy to read even at a distance. Buff recommendations, from the complete line of American Buffs, both automatic and conventional types, are based on current usage in many leading industrial finishing shops.

Corrosion-Proof Materials and Services

Ceilecote Company, Dept. MF, 4844 Ridge Road, Cleveland, Ohio.

A new catalog No. G-201, "Complete Corrosion-Proofing Service for Industry," has been published, which presents, in concise form, comprehensive information on a complete line of corrosion-proof linings, bricks, bonding cements, protective coatings and mastic floors. Manufactured from a variety of base formulations, these materials have different chemical and physical properties that will meet the requirements of a wide range of industrial applications.

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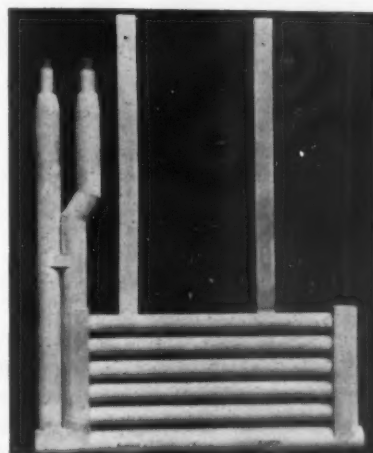
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services rendered by the company also are outlined in the new catalog. These include furnishing materials, supervision for the installation, or contracting for the complete job including labor, materials, equipment and supervision.

To facilitate selection of the correct lining, cement, brick or coating, a comprehensive chart is included in the new publication. This covers application method, general uses, temperature resistance, base formulation, resistance to nineteen commonly encountered chemicals, and other data on each product.

Pressure Bantam Demineralizer

Barnstead Still & Sterilizer Co., Dept. MF, 223 Lanesville Terrace, Forest Hills, Boston 31, Mass.

Just published is a new Bulletin #128 which, according to the manufacturer, describes in detail the new Pressure Bantam Water Demineralizer. It delivers demineralized water under pressure so that it can be piped to any desired point where the mineral-free water is actually used. The demineralizer employs a renewable cartridge containing ion-exchange resins easily replaceable when exclusive Pura-Lite

(purity indicating light) goes out when new cartridge is needed.

The bulletin gives a complete description of the ion-exchange process and how ionizable impurities are removed.

Cleaning Compound

Metasurf Corp., Dept. MF, 12830 Eaton Ave., Detroit 27, Mich.

Just published is a booklet containing technical data on Surfclean No. 10, a new compound for cleaning and preparing for paint, parts too large or bulky to be processed by conveyorized methods.

Surfclean No. 10 will remove all normal soil, oil, and dirt as well as rust, tarnish, and corrosive salts. Metal surfaces treated with Surfclean No. 10 are etched to give excellent paint adhesion and are converted to an iron phosphate coating for long paint life and durability.

Protective Apparel

The Surety Rubber Co., Dept. MF, Carrollton, Ohio.

The above firm has issued a bulletin

on its industrial aprons and other protective apparel (sleeves, leggings, spats and gloves), for "chin-to-toe" protection. Actual swatches of material are included, with an explanation of the type of service for which each is best suited.

For a copy of the bulletin or additional information contact the firm at the above address.

Synthetic Resin Coatings

MW Protective Coatings Division, Metalweld, Inc., Dept. MF, Scotts Lane & Abbottsford Ave., Philadelphia 29, Pa.

A new eight-page bulletin on synthetic resin coatings describing vinyl, phenolic, saran, polyethylene, epon, neoprene, plastisol, and silicone coatings has just been made available.

Strippable Protective Coating

Ernest Bischoff Co., Inc., Dept. MF, Ivoryton, Conn.

The above firm has issued a folder on Thermo-Cote, a strippable protective coating for corrosion and abrasion protection of metal parts.

Descriptions of the coating, advan-

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tages, and application are given, plus a list of the many parts it can be used on.

For complete information, or a demonstration, contact the manufacturer at the above address.

Pump and Exchanger Selection Charts

Carl Buck & Associates, Dept. MF, Essex Fells, N. J.

A list of all common plating and pickling solutions and the proper material to use for pumps and exchangers has recently been compiled and is available upon request.

This data also includes simplified formulas and nomographs for the proper sizing of exchangers for heating and cooling the various solutions used in plating and pickling.

Precision Tumbling

BMT Mfg. Corp., Dept. MF, 102 E. 9th St., Elmira Heights, N. Y.

SlideHoning, the modern precision tumbling process, is described in a colorful booklet. Metals, plastics, castings, and parts of all kinds previously

considered impractical to finish in tumbling machines are now successfully handled by the new unit. The controlled-motion honing does not affect the dimensional tolerances of the pieces yet removes burrs, flash, tool marks, rust, paint, plating, and heat treating scale.

Automatic Plating Machine

Automatic Plating Equip. D'v., Wagner Brothers, Inc., Dept. MF, 400 Midland Ave., Detroit 3, Michigan.

Presented in easily read editorial style, Bulletin B 50-54 describes a revolutionary concept in plating automation — the company's fully automatic plating machine.

The literature contains a comprehensive explanation of the unique parts transfer and conveying principle which permits highly efficient processing of parts through the entire plating cycle with $\frac{1}{2}$ the labor and power requirements of ordinary automatic platers of comparable size. Drawings and illustrations show basic movements.

Also described are details of all components such as controls, power package and accessory hydromotors for

smooth translation of power, reciprocating carriage and work lifting arms, agitation mechanism.

Other features discussed are: maintenance, transportation and installation, lubrication, construction, cycle timing and special adaptations.

Wet Type Dust Collectors

Newcomb-Detroit Co., Dept. MF, 5741 Russell St., Detroit 11, Mich.

Just issued is a new 24-page bulletin on Uni-Wash dust collectors. Both Junior and Senior models are fully described with engineering data, dimensions and application photographs.

Direct driven units and vee belt units are described in detail. Automatic sludge conveyor and automatic water level control features are described. Data on cooling effect, evaporation and dust count is included. Rule of thumb method for estimating air volume for dust control systems is included.

Down-draft bench collectors for magnesium, aluminum and hazardous dusts are shown. Floor type units and conveyORIZED units are described.

Principles of industrial ventilation are included.



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Filtration Manual

D. R. Sperry & Co., Dept. MF,
Batavia, Ill.

This new, fully revised edition is a complete source of current information about industrial filtration equipment and methods.

Written more as a text and reference manual than as a selling brochure, it contains sections devoted to full discussions on the nomenclature and advantages of the plate filter type press; a detailed comparison of flush plates and frames versus recessed plates; construction features of the various leak-proof, wood, and special type plates; graphic specifications on all standard Sperry filter presses, closing devices and accessories, filterable materials and filter bases; as well as the terminology and step-by-step digest of the entire filtration operation — from clothing, closing, filling, washing, and opening.

pH Bulletin

The Bristol Company, Dept. MF,
Waterbury 20, Conn.

A new bulletin on complete instru-

mentation for pH measurement and automatic control contains drawings and photos of installations of pH recording and controlling instruments on specific processes in the drying, chemical, food, rubber, petroleum, pulp and paper, textile, water treatment, sewage disposal, and metals fields, as well as detailed drawings on different methods of installing the various instruments for pH measurement.

The bulletin features complete pH systems, including the electrode assemblies, amplifier, and Electronic Dynamaster round- or strip-chart recorders and controllers in both pneumatic or electric control actions. The new Beckman Model W Amplifier is illustrated and detailed for the first time in conjunction with a pH recording and controlling system.

Accessories shown in the bulletin include: electrodes and assemblies, manual and automatic multiple switching stations for recording pH measurements from more than one point with a single Multiple-record Dynamaster; connector boxes for use where it is necessary to offset the amplifier more than ten feet from the electrodes; and a complete line of final control ele-

ments for adding liquid, solid, slurried, and gaseous reagents to the process. The 38 page bulletin Q1304 is illustrated with 100 photos and detail line drawings.

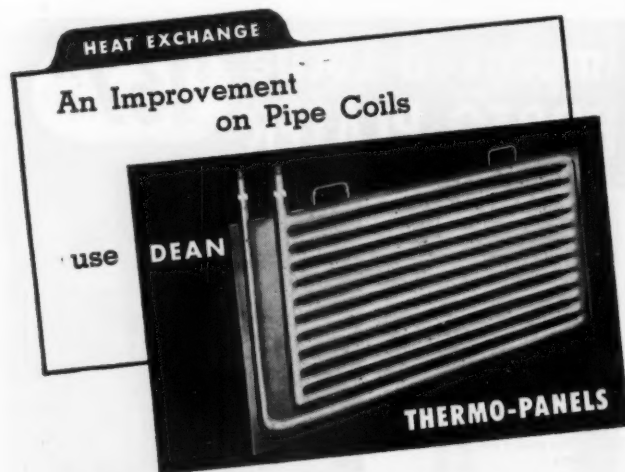
Table-Type Blast Cleaner

American Wheelabrator & Equip.
Corp., Dept. MF, 1179 S. Byrkit St.,
Mishawaka, Ind.

A new bulletin describes a new table-type airless blasting machine, called a 72" Wheelabrator Swing Table, which is distinct from other swing-table-type airless blasting machines in that it requires no pit at all for the abrasive hopper, whereas other types in the past have required them.

Special features of this machine are the 72" diameter plain work table which is mounted on the door of the machine. When the door is open, the work table come out of the machine for ease in loading and unloading. When the door is shut, the table automatically moves into the blasting zone of the machine and rotates the work under the abrasive blasts from a rotating, bladed wheel mounted in the cabinet roof.

One part of the bulletin, No. 944,



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shows how loading and unloading of this machine can be done very rapidly by means of auxiliary tables. These are handled either by lift truck or by jib crane, and one of these can be loaded and unloaded while another one is on the main table and undergoing blast cleaning.

Another interesting feature explained in this bulletin concerns the special vestibules that are available in the walls of the machine so that it can accommodate occasional long pieces, which would be beyond the standard capacity of this size machine.

Complete electrical and mechanical specifications and views showing overall dimensions are included. The various mechanical components of the machine are described and shown in the many illustrations.

Associations and Societies

1955 INDUSTRIAL FINISHING EXPOSITION

The 1955 Industrial Finishing Exposition will be held in conjunction

with the 42nd annual convention of the *American Electroplaters' Society* in Cleveland Public Auditorium, Cleveland, Ohio, June 20-23, 1955. The educational sessions and business meetings will be held under one roof in the same building as the exposition. It is anticipated that over 200 exhibitors will utilize a total of 100,000 square feet in the Arcade and Upper Level of the Auditorium.

The 1955 exposition will be attended by over 12,000 production supervisors, engineers, chemists and other executives from the over 8000 electroplating and industrial finishing plants in the United States. Cleveland Public Auditorium is located in the geographical center of this industry and is overnight from 90 per cent of these plants.

Exhibitors will be those companies who manufacture equipment, supplies and services used in the industrial finishing and electroplating plants. Items to be exhibited will be the latest developments in services and products that enable the industrial finisher and electroplater to make his own manufactured product better with greater sales appeal and durability.

The A.E.S. has selected the Amer-

ican Decorating Co., Cleveland, Ohio to manage the exposition. *Harold E. Bartlett* and *Albert W. Erickson*, from the management staff of American Decorating Co., will serve as exposition managers.

The Cleveland Branch will be hosts for the 42nd annual convention and the 1955 exposition. The convention committee is composed of *E. L. Combs*, Diamond Alkali Co., and *C. F. Ott*, Aircraft Plating and Polishing Co. co-general chairmen; *F. H. Bruening*, Oakite Products, Inc., chairman of the Banquet sub-committee; *John B. Winters*, R. W. Renton and Co., chairman, educational program; *J. D. Little*, McGean Chemical Co., chairman, entertainment; *J. T. Hyde*, Durable Plating and Supply Co., chairman, finance; *J. W. Baker*, Cleveland Platers Supply Co., chairman, publicity; *R. W. Renton*, R. W. Renton and Co., chairman, athletic events; *W. F. Acks*, Bechtel-Laughlin Co., chairman, convention registration; *W. M. King*, Cleveland Graphite Bronze Co., chairman, plant visitation and *Mrs. A. R. Hoffman*, Hoffman Plating Co., chairman, ladies activities.

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the chairmanship of *Leon R. Westbrook*, consultant, includes as committeemen; *Howard H. Blouch*, Chromium Corp. of America; *Eugene L. Combs*, Diamond Alkali Co.; *Herb Head*,

Chrysler Corp.; *P. P. Kovatis*, executive secretary of AES.; and *Dr. Ralph A. Schaefer*, Clevite-Brush Development Co., division of Clevite Corp.

Dr. Serfass, Lehigh University, Elected to Top A.E.S. Post

Dr. Earl J. Serfass, head of the Lehigh University Chemistry Department, was re-elected chairman of the Research Committee of the *American Electroplaters' Society*. This announcement was made by *P. Peter Kovatis*, executive secretary of the A.E.S.

A recognized authority in the fields of chemistry, electroplating and metal finishing, Dr. Serfass is responsible for close to a dozen A.E.S. research projects being carried out in various universities, research foundations and private industry in the United States and Canada. His committee comprises 10 top men in the field with close to 100 additional members of the Society representing more than 40 large, medium and small corporations and several government agencies.

Other members elected to the Research Committee at the recent New York City convention include *Leslie C. Borchert*, Houdaille-Hershey, De-

troit; *Robert J. Racine*, Wyandotte Chemicals, Wyandotte, Mich.; *Arthur P. Wrisberg*, Davies Supply, St. Louis; *Myron B. Diggin*, Hanson-Van Winkle, Munnings, Matawan, N. J.; *Lloyd O. Gilbert*, Rock Island Arsenal, Ill.; *Edwin R. Bowerman, Jr.*, Sylvania Electric, Long Island, N. Y.; *Arthur H. DuRose*, Harshaw Chemicals, Detroit; *Dr. Edward A. Parker*, Technic, Inc., Providence, R. I.; and *Dr. William Blum*, Washington, D. C.

Appointments to Plating Editorial Board

Five appointments have been announced to the editorial board of *Plating*, the official publication of the *American Electroplaters' Society*.

According to managing editor, *P. Peter Kovatis*, the following appointments were for three years and included *Dr. Harold J. Wiesner*, Bendix Aircraft Corp., South Bend, Ind.; *Robert D. Miller*, Electric Auto-Lite, Sharonville, O.; and *Howard J. McAleer*, Formax, Detroit, Mich. *John B. Winters* of R. O. Hull, Cleveland, O., was named to a one year term as educational liaison member, Cleveland



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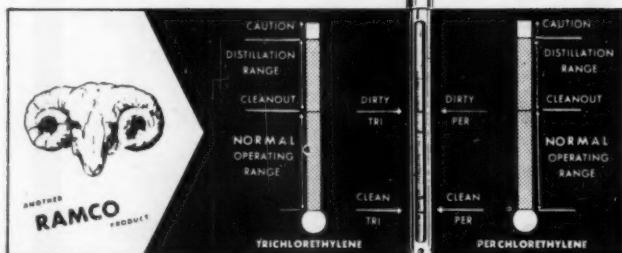
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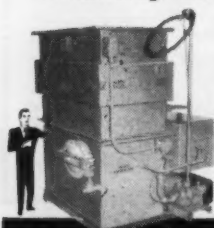
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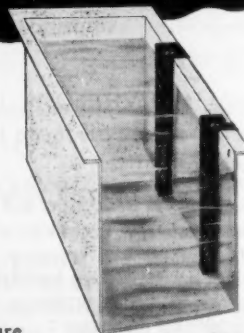
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A.E.S. branch convention committee; and Dr. Abner Brenner, National Bureau of Standards, Washington, D. C. was named to a two-year term as liaison member, Baltimore-Washington A.E.S. branch convention committee.

Other members of the editorial board are Edwin R. Bowerman, Jr., Sylvania, Long Island, N. Y.; Daniel Gray, Oneida, Syracuse, N. Y.; William C. Geissman, Rockford Lock, Rockford, Ill.; Fred Fulforth, United Chromium, Philadelphia, Pa.; Charles W. Ostrander, Allied Research, Baltimore, Md.; Leslie C. Diveley, Cutler-Hammer, Milwaukee, Wis.; and P. Peter Kovatis, Plating magazine, Newark, N. J.

National Assn. of Metal Finishers

At the annual meeting of the board of directors, held on Monday, July 12th, in conjunction with the Federation's Second Management Seminar in New York, new officers for the 1954-55 term were elected.

Elected president was J. Robert Greenwell, Chrome-Rite Co., Chicago. During the past two years he has been

Federation second vice president. He is a past chairman of the Chicago Electroplaters Institute, and is one of three men who have ever held that post for two successive years.

Frank Kaiser, Long Island Mechanical Plating Co., Long Island City, N. Y., was re-elected to the post of first vice-president. Second vice-president is Lawrence J. Hay, Plating Service Co., Chicago, and Alfred A. D'Agostino, Alberts Plating Works, Inc., Brooklyn, N. Y., was elected secretary-treasurer.

Both Hay and D'Agostino are newly appointed to the Board of Directors by their respective local associations, replacing Carl F. Hansen of Advance Tinning Co., Chicago, and Philip Ranno, Imperial Plating Co., Brooklyn, who have retired from the Board this year.

THE ELECTROCHEMICAL SOCIETY

A symposium on vacuum metallurgy will be held at the Hotel Statler, Boston, Mass., as a part of the 106th meeting of the Society, October 3-7, 1954.

Sponsored by the Electrothermics and Metallurgy Division of the Society, the symposium will be inaugurated at 2:00 P.M. October 6 with a

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3
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Ample plating is assured even in deep and odd shaped locations. Deposit thickness and quality can be accurately and easily gaged.

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keynote address, "The Bright Spark in the Metals Industry," by *Dr. James D. Nisbet*, director of research of the Universal Cyclops Steel Corp. The program will continue through October 7 with papers by well-known authors on vacuum melting, vacuum heat treating, and the properties of the metals and alloys thus produced. New vacuum equipment and techniques will be presented, and the program will close with a session on the volatility of alloy components and the use of such data in purification and recovery by vacuum distillation.

NEW BOOKS

French-English Dictionary for Chemists

By *A. M. Patterson*. Published by *John Wiley & Sons, Inc.*, 440 Fourth Ave., New York 16, N. Y. 2nd Edition 1954. Price \$6.50. 476 pages.

Even with the omission of words which have the same spelling and meaning in French and English, the vocabulary of this new edition has grown to an estimated 42,000 words. It will be of inestimable value to technical men who have been finding that French scientific developments are looming more and more important in the literature, after almost complete cessation during the greater part of a decade. Most of the technical terms, especially those of recent origin, are included in what is generally consid-

ered to be one of the most popular works of its kind. This book is a must for those desirous of obtaining full value from papers presented in the French language.

Handbook of Industrial Electroplating

By *E. A. Ollard & E. B. Smith*. Published for *Metal Industry*, 9 Charlotte St., Birmingham 3, England. 2nd Edition 1954. Price \$4.20 post-paid. 366 pages including index.

This book is similar to the *METAL FINISHING GUIDEBOOK-DIRECTORY* in scope and contents but slanted toward the requirements of the British metal finisher. Therefore, for example, 16 pages are devoted to rectifiers while only 6½ pages cover motor generators. Formulas are given for copper-cleaners and cold cleaners, processes we would consider outdated. On the other hand the sections on testing are quite complete, although the volume would be considered padded with material which is of practically no interest to a metal finisher. We see no reason to include a photo of a BNF jet test apparatus along with a duplicating diagram, which fully describes the apparatus, or for two photos of a full-automatic plating machine, one with the hangars up and one down. The book uses 4½ pages to describe one particular type of pump and also describes air-actuated and diaphragm pumps, but omits any mention whatsoever of the centrifugal pump. Only one formula is given for protecting magnesium, one page is devoted to plating on aluminum and 1½ pages to plating on non-conductors.

Despite the book's shortcomings, the tables published at the end would suffice to make it a worthwhile purchase since they are both complete and valuable. As a descriptive survey of British practice the volume makes interesting reading and would be a desirable addition to the plant library.

Finishing Handbook & Directory

Edited by *I. S. Hallows & A. G. Bennett*. Published by *Sawell Publications Ltd.*, 4 Ludgate Circus, London, E. C. 4, England. 1954 edition. 501 pages.

This book, which is available to subscribers to *Product Finishing* magazine (British) would be of more interest to British than to American finishers, since the sections on Trade Names and Suppliers are a very important part of the volume. However, extended

sections on organic finishing and vitreous enamelling are of value to plant men on both sides of the ocean. Aside from these, the contents include transfer and marking processes, chief types of zinc coating methods, flocking, and refinishing motor cars. This handbook contains, each year, a number of subjects which we rarely find in any one source of information.

News from California

By Fred A. Herr



The deepest hard chromium tank west of the Mississippi River has been installed by Superchrome Engineering Co., located at 1504 East Washington Blvd., Los Angeles, according to Kasmer F. Tarczynski, general manager.

The tank, 45 feet deep with a diameter of three feet, was designed and engineered to apply hard chromium to oil barrel tubes, plungers, polishing rods and other oil drilling equipment in lengths of 20 feet and over. Mr. Tarczynski pointed out to METAL FINISHING that this is a highly specialized field in which his company has enjoyed outstanding success with heretofore limited facilities. The firm specializes in all industrial hard chromium plating and ranks as the largest in Southern California in that field of finishing. Tarczynski added that he hoped that this and other installations planned for the future will establish Los Angeles as the center for hard chromium plating of oil and specialty manufacturing equipment on the west coast.

Frank R. Zadik and James Fall have organized the Delta Plating Co. in Pasadena, Cal., and have equipped a shop at 1032 Pico St. for specializing in hard chromium work on aircraft parts and instruments. Initially they have installed 500 gallons of hard chromium solution facilities with complementing cleaning and other equipment. Cadmium is to be added later.

The venture signifies the return of Zadik to the plating industry after a number of years activity in photographic work. He originally started in plating as a helper in a job shop in

Painesville, Ohio. Fall is a Pasadena city fireman.

Victor H. Schwartz, executive vice-president of the L. H. Butcher Co. of Los Angeles, a subsidiary of the Udy-lite Corporation, announces the appointment of Richard T. Coen as manager of the company's San Francisco operations which are located at 15th and Vermont Sts. Butcher, with other offices in Seattle, Wash., Portland, Ore., and Salt Lake City, Utah, is active in the manufacture and distribution of supplies and raw materials for the metal finishing, ceramic, glass shop and paint industries.

The research and development division and laboratories of the Merrill Co., San Francisco metallurgy and engineering firm, have been acquired by Arthur D. Little Inc., which recently established an office in San Francisco as a base for its west coast technical-economic survey work. The firm has staffed the San Francisco branch with personnel competent in organic and inorganic chemistry, physics, mechanical engineering, metallurgy and other fields of applied science requisite to the broad scope of work in consulting industrial research and engineering.

The American Metals Service Corp. has opened for business at 90 Oak Knoll Ave., Pasadena, Cal. The organization was formed by a group of Southern California and Illinois business men and engineers to offer service to the metal working industry in

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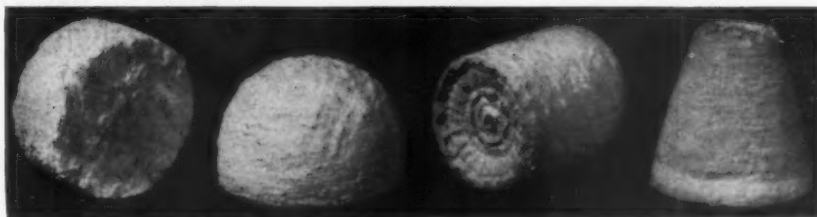
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converting from military to commercial production. It will also serve as manufacturers' representative for tools and equipment. A mid-west office has been established at 2315 Cumberland St., Rockford, Ill. *John P. Schoentgen* is president, *J. F. Satterfield*, vice-president, and *Karl F. Geiser*, secretary-treasurer.

Metal Control Laboratories, Inc., Huntington Park, Cal., announces the establishment of a special projects department which will be devoted to conducting research and development for industry, specifically for small firms having no research facilities of their own. The new department is being operated on the basis of conducting all projects in strict confidence, with data, patent rights, etc., remaining the property of the contractor. *J. Diskason* is general manager.

Pittsburgh Plate Glass Co. announces the appointment of *Herschell E. Post* as general manager of its Pacific Coast Paint Division at Torrance, Cal. Post, one of the nation's leading authorities on industrial finishes, has been affiliated with the paint

industry since the early 1920's and has been with this company since 1930.

McCullough Motors Corp. of Los Angeles has established a new division for mass-production of high-pressure magnesium and aluminum die-castings on order. This new division will supplement the recent announcement pertaining to expansion of the company's die-casting facilities which have been increased to 200,000 pounds per month of magnesium castings by the addition of two new 600-ton machines.

With the return from east in mid-July of *Earl Arnold* (he attended the A.E.S. convention in New York), first vice-president and membership chairman of Los Angeles Branch of the A.E.S., branch president *G. Stuart Krentel* and Arnold conferred on ways and means of keeping the branch's membership drive from lagging during the summer months when no meetings are held.

Los Angeles Branch, now fourth in size in the Society, has firm hopes of narrowing the gap which now sepa-

rates it from New York Branch (335 to 277) and possibly drawing away to a more comfortable position from Newark Branch's 276.

To this end, Arnold and the members of his committee settled on a program that will keep the membership drive fresh in the minds of the membership during the summer months. Phone calls to prospects, mailing pieces with membership blanks attached, and other reminder activity were initiated by Arnold and Krentel to keep the drive alive until the resumption of monthly meetings in September afford the more personal and direct contacts that the meetings afford.

The campaign, which was initiated in April to run to April 1955, calls for the presentation of monthly merchandise certificates to the one signing up the most new members each month and a \$50 grand prize to the one who accounts for the largest total at the end of the drive.

The branch's fall series of business meetings and educational sessions will get underway Wednesday, September 8, at the Rodger Young Cafe, Los Angeles.

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